Pit and Quarry

SAND • GRAVEL • STONE

HANDLING • CRUSHING • SCREENING • WASHING

AMSCO

SAND AND GRAVEL PUMPS

THE PRICE SAND COMPANY
TULSA, OKLA.

March 8, 1917.

American Manganese Steel Co.,
Chicago, Illinois.

Gentlemen:—

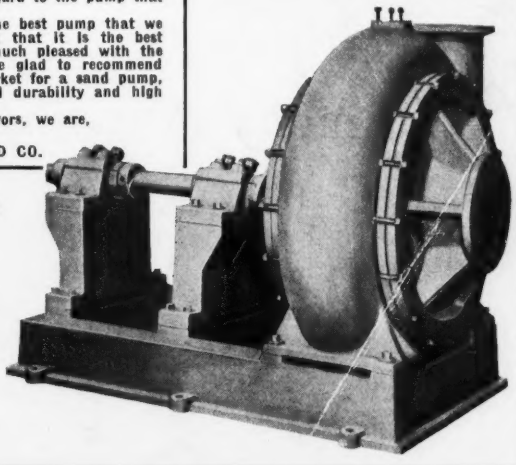
Your letter of Feb. 24th in regard to the pump that you furnished us:

Will say that this pump is the best pump that we have ever purchased and think that it is the best pump made, and we are very much pleased with the results we get from it. We are glad to recommend it to any one who is in the market for a sand pump, on account of its simplicity and durability and high standard of efficiency.

Thanking you for the past favors, we are,

Yours truly,

By Lee Price. PRICE SAND CO.



WRITE FOR OUR BULLETIN NO. 72

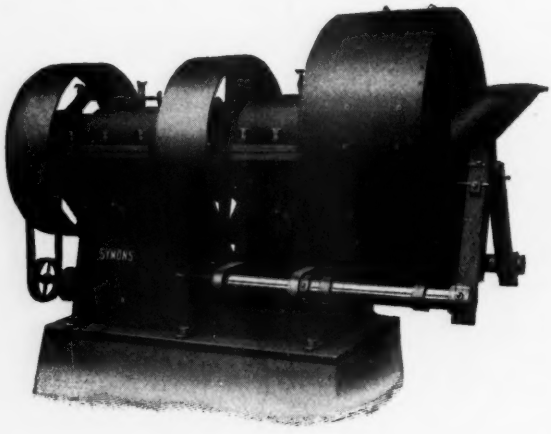
AMERICAN MANGANESE STEEL CO.

McCormick Building

CHICAGO, ILLINOIS

MARCH 1917

Symons Disc Crusher



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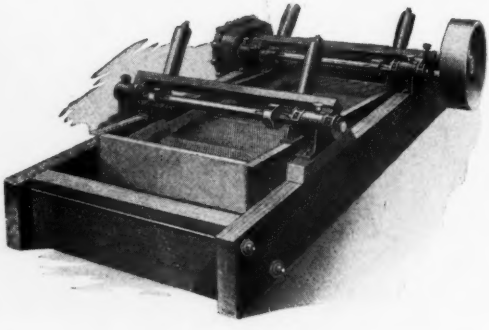
Large Capacity Uniform Size.

In Operation in Nearly Every State

BUILT IN FOLLOWING SIZES.

Size	18	inches	Capacity	5 to 15	Tons	Per	Hour
"	24	"	"	12 to 30	"	"	"
"	36	"	"	25 to 65	"	"	"
"	48	"	"	45 to 120	"	"	"

Simons Pulsating Screens



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Larger Capacity
Less Repairs
Less Floor Space

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CHALMERS & WILLIAMS

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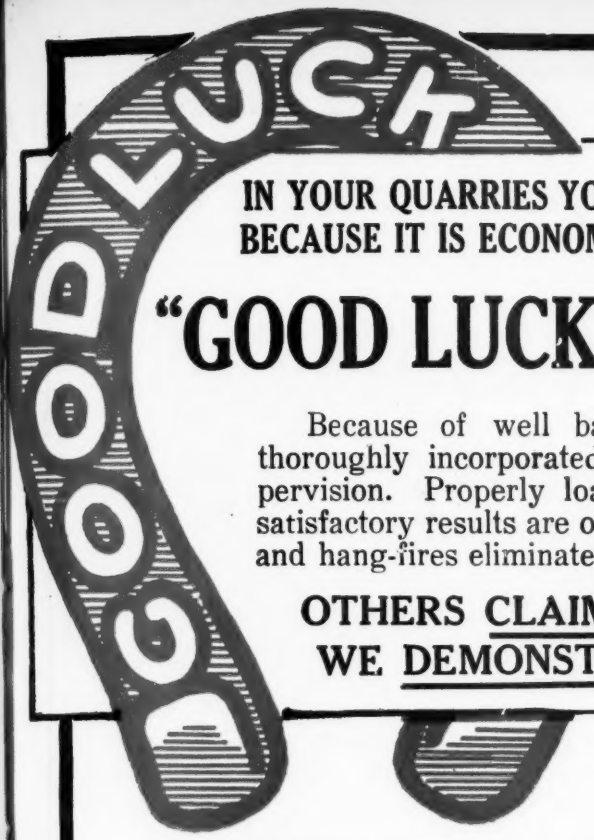

IN YOUR QUARRIES YOU WANT THE BEST,
BECAUSE IT IS ECONOMICAL AND SAFEST

"GOOD LUCK" IS BEST

Because of well balanced formulaes, thoroughly incorporated under expert supervision. Properly loaded, uniform and satisfactory results are obtained, miss-shots and hang-fires eliminated.

OTHERS CLAIM SUPERIORITY
WE DEMONSTRATE IT

DYNAMITE!

is not all alike—nor should be. What is right for one operation is wrong for another. "GOOD LUCK" Dynamite in its various grades and strengths is prepared to meet the most exacting conditions in pits and quarries. Its reputation is high, its quality higher. The superiority of "GOOD LUCK" Dynamite is easily demonstrated and we are prepared to do it. We claim "GOOD LUCK" Dynamite is absolutely the best and we will prove it to you. Your inquiries earnestly solicited. We know they will result to our mutual advantage.

BURTON POWDER CO.

Chicago, Ill. **Pittsburgh, Pa.**

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FOR

Washing and Screening Sand and Gravel

THE result of long study and experiment in proper methods and machinery design, for producing thoroughly clean and sharply separated materials.

Two well-known screening principles are combined in one unit which results in an economy of power consumed and maintenance expense as well as a saving in first cost on both machinery and building.

Let us submit plans and estimates on an outfit designed to meet *your* needs.

THE WEBSTER M'F'G COMPANY

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CHICAGO (156) NEW YORK

Probably you have never fully appreciated the immense economical value of

EQUIPMENT to Pit or Quarry Operators

FIND OUT!

Breakage of crushers, hoists, pumps, shovels, washing and screening mechanism may be quickly and inexpensively repaired with the Oxweld Welding Blow Pipe. The illustration above shows a Centre Casting from a Steam Shovel being repaired; its cost to replace would have been $300, its cost to repair with Oxweld equipment was considerably less than one-tenth that amount.

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For Best Results

AT any time of year and under any conditions, Hercules Explosives give satisfaction. During winter, especially, their use is desirable if the best results are to be obtained. Hercules L F. (Low Freezing) Explosives will not freeze until after water freezes. Because of this their use during cold weather promotes safety and efficiency.

Hercules L F. Explosives are as follows:

Hercules L. F. Nitro-Glycerin Dynamite. Made in all strengths from 15 per cent. to 60 per cent.

Hercules L. F. Extra Dynamite. Made in all strengths from 25 per cent. to 60 per cent.

Hercules L. F. Extra Gelatin Dynamite. Made in all strengths from 35 per cent. to 80 per cent.

Hercules L. F. Permissibles. These explosives are made expressly for use in dusty and gaseous mines.

For an informative booklet on the use of L. F. Explosives address

HERCULES POWDER CO.
Wilmington, Delaware

Investigated and Compared
Tested, Approved and Adopted by

THE UNITED STATES ARMY

Who recently awarded to us the largest and one of the most important orders for **Blasting Machines** ever placed in this country, they specifying our

TRADE **"NEW YORK"** NAME

Blasting Machine

Why?

QUALITY, FFFICIENCY, RELIABILITY
EXCELLED—THAT'S ALL

Sectional views of a No. 4 50-Hole "New York" Blasting Machine. None better made.

Price of this machine, $37.50 net, by express paid

We also make **five** other styles, a **size** and **kind** for **every blasting purpose.** It will afford us pleasure to mail, at your request, our new illustrated, descriptive and testimonial catalogue.

NEW YORK BLASTING SUPPLY COMPANY

WILLIAM W. NICOLL, Director

1899 Bowling Green Building, NEW YORK CITY

Standard
MADE IN DETROIT USA

Over 65% of the Orders for Standard Trucks Are "Repeats."

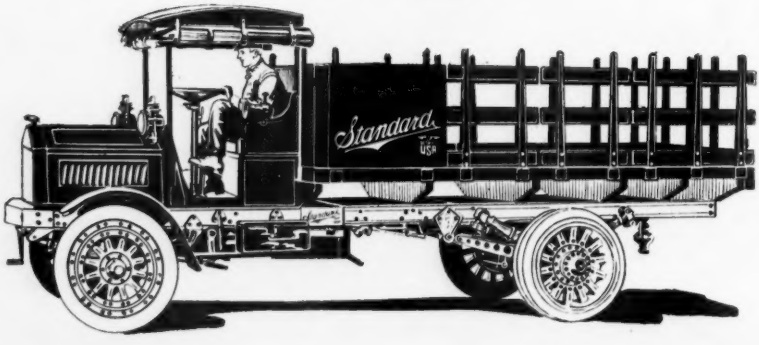
"Repeat" orders indicate satisfied owners. The name "Standard" on a motor truck means all that the word implies. It insures durability, service and satisfaction and the purchase of a Standard Truck is an assurance that your investment will have a higher net earning power, both in truck value and of continuous service. No better proof of this statement is offered than that 65% of the present owners have repeated their orders. This high percentage of "repeat" purchasers, by referring to transportation experts, know exactly how to make comparison and have given the STANDARD TRUCK preference in almost every comparison of value, accessibility, durability, economy and performance.

Cement dealers, contractors and builders have proved to themselves, beyond the question of any doubt, that the STANDARD Truck is the most reliable and profitable investment that they can make, because the design and construction is standard and standardized in every unit.

Are you familiar with the latest STANDARD model? If not, write for catalogue 26-B and list of STANDARD owners, furnished free upon request.

STANDARD MOTOR TRUCK COMPANY

DETROIT, MICHIGAN



Duplex Hauls Gravel For Five Cents Per Yard Mile

Duplex Four-Wheel Drive Trucks have solved the haulage problem for pit and quarry operators.

Five miles per gallon—with capacity loads—3½ tons—is the usual gasoline consumption of the Duplex.

One contractor says a Duplex has reduced his haulage costs to five cents per yard mile. He tells how he operates a gravel pit efficiently.

We will send you a copy of his letter—and it is well worth reading. It gives information of interest to every pit and quarry owner who would conduct his business with best results. Write for the letter today.

Address all communications to Dept. 137

Duplex Truck Company

Lansing, Michigan

ALFALFA BELTING

SOLID WOVEN
No Plies to Separate

Absolutely Waterproof

Will Not Get Hard in Cold Weather
Greater Tensile Strength than Leather
Cheap as the Cheapest Rubber

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Agricultural Limestone

Must Be Uniform and Finely Pulverized to Meet the Demands of the Farmer

THE

BRADLEY THREE ROLL MILL

Produces This Fine Pulverized Material in Single Operation at an Extremely Low Cost for Production. It Takes Limestone 1" and Under, Delivering Finished Product which Is Ready for Shipping.

Send for sample of Ground Material Catalog and Full Data. Many of the Largest Agricultural Limestone Producers Claim This Machine Is Without an Equal.

Bradley Pulverizer Co.

Works: Allentown, Pa. **BOSTON**

There's a Difference of Many Dollars

—in your profits if you use modern, serviceable machinery in your Pit or Quarry

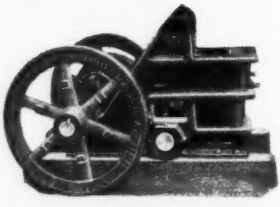
We specialize on quarry equipment, and can furnish anything you may need, from a "Ton-a-Minute" Rock Crusher to cable for drawing up cars. We design, build and install modern labor saving quarry plants of any capacity required. We will gladly figure on any size crushing plant you may require.

Sand and gravel washing plants are our specialty. We have installed such plants for some of the largest concerns in the country.

One of the complete Crushing Plants recently installed

If you are considering a crushing plant, large or small, or gravel screening and washing machinery, drop us a line and we will be glad to supply complete information.

Our catalogue F. A. Y. will be furnished free and without obligation.



View of Steel Frame Crusher. Simple, durable and efficient. Made in many sizes.

The Good Roads Machinery Company, Inc.
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TRAYLOR
GYRATORY CRUSHERS

Combine more Good Features than any other Gyratory built

An extra large Eccentric, greater in diameter and longer than others.

A shaft 25% larger in diameter than others.

A perfect all-steel suspension at the point of least motion, giving a perfect rolling motion to the shaft.

Lubricating system that forces all dirt from the eccentric cavity, assures a cool running and long lived eccentric.

These and many other points of superiority assure you of the

MAXIMUM OUTPUT

Bulletin G-3 will interest you. Send for it.

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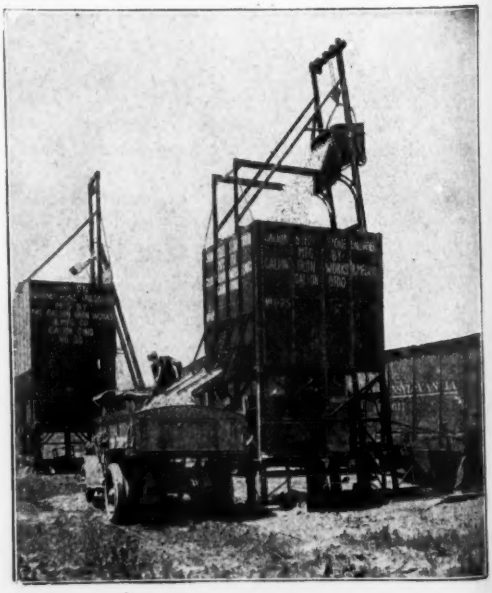
THE GALION IMPERIAL

IS BY FAR THE MOST PRACTICAL, EFFICIENT, ECONOMICAL AND PORTABLE

GRAVEL SCREENING PLANT

The highest class road or concrete material may be quickly, efficiently and inexpensively produced from low grade gravel, with the Galion Imperial Gravel Screening Plant. Moreover it is very easily moved from place to place—a fact of inestimable value to the operator of several small pits.

The Galion Imperial Gravel Screening Plant discharges right into the wagons or trucks—and it will keep them "humping" to keep up with it. Its operation in this respect is based on the same principles as the world famous Galion Unloader.



Save $25 Daily

You can do it—and more too—in labor alone, with the Galion Unloader. This is the only unloader that has withstood the test of time. It is established.

Write for complete list of descriptive circulars for sand, gravel and stone men and for road builders

The Galion Iron Works & Mfg. Co.

Mfgrs. of Road Machinery, Cast Iron and Corrugated Pipe for Culverts, Stone Unloaders, Contractors' Supplies, Etc.

Main Office and Works: GALION, OHIO

CHICAGO: 838 MONADNOCK BLOCK

Universal Crushers

are built in 25 sizes portable or stationary, and are **Money Makers** for Pit men to crush their oversize and Quarry men to enable them to produce small crushed stone for the concrete man, road builder and contractor.

Makes a product from oversize gravel or Quarry rock from ¼ to 3" in one operation.

Capacities from 5 to 300 tons per day. Jaw openings 5x6 to 14x24 inches equipped with manganese jaws and removable bronze bearings.

Send for Catalogue of full line of Universal and Eureka crushers, rolls for fine grinding, Elevators and screens of all sizes, also full line of Universal Brainard Pulverizers.

UNIVERSAL CRUSHER CO.
200 Third Street, Cedar Rapids
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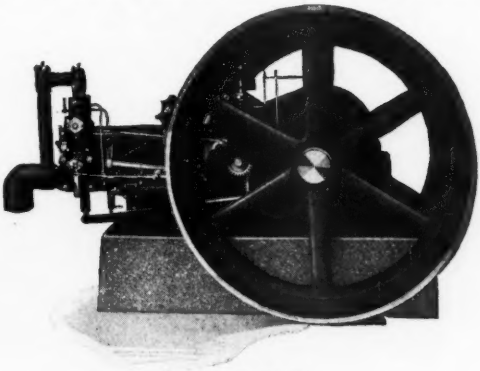
CHARTER OIL ENGINES

Will pump your water, wash your sand and gravel, crush your rock and stone, at less cost than you can possibly do it for by using steam or electricity

The Logical Power for Isolated Plants



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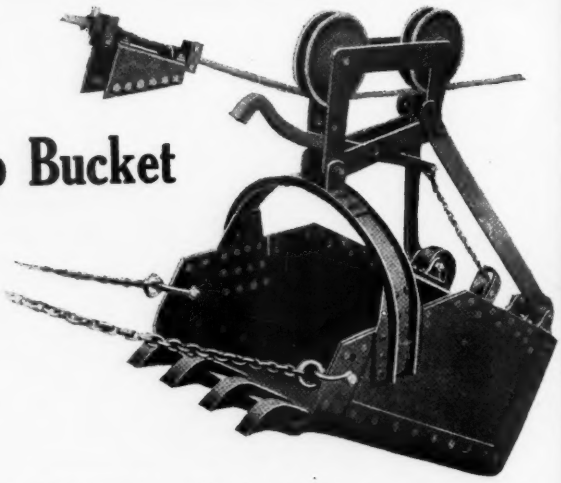
The Pioneer Back Dump Bucket



for slack cable excavation of sand and gravel, as well as miscellaneous excavation.

Our booklet "PIONEER EXCAVATING OUTFITS" is free, send for it.

The Mansfield Engineering Co.

Fletcher Trust and Savings Bldg. Indianapolis, Indiana

EVERY PLANT IS A PAYING PLANT THAT IS A NEGLEY PLANT

You sand and gravel men make or break your business with your equipment. Excavate and convey at low cost—and your success is assured. Competition is a comparison of production costs.

Sand and Gravel Plants that are held up to the trade as notable examples of efficiency methods, employ the NEGLEY PATENTED EXCAVATOR. It operates on a slack cable-way with a two drum friction engine, and requires only three feet six inches clearance.

That NEGLEY EXCAVATORS accomplish the highest economy and possesses a *permanent* efficiency is well known. Their adaptability to *your* needs we will be glad to show you on request. Write us today.

INDIANAPOLIS CABLE EXCAVATOR CO.

403 K. of P. Bldg., Indianapolis, Ind.

Pit and Quarry

Vol. I **MARCH, 1917** **No. 3**

A Bi-Monthly Journal for Producers and Marketers of Sand, Gravel and Stone.

Subscription Price $1.00 *Per Year.*

Address Pit and Quarry, 527 S. La Salle St., Chicago. Tel. Harrison 6729.

Winter Delivery

The cold weather of the past winter, combined with the unusual traffic conditions which have brought about more than the ordinary car shortage, have together operated to delay the delivery of building materials in a great many cases.

In some localities it is stated that the gravel frozen in solid masses in freight cars has caused some of the railroads to place an embargo on shipments of such materials. The gravel freezes to such a degree that it cannot be broken by ordinary means, thereby holding freight cars idle for a longer period than is feasible in a time of car shortage.

Fortunately there are at present signs of an early breaking up of the cold weather, so that it will not be long before producers will be able to operate to their full capacity.

It might be well to suggest, however, that there is a growing tendency among concrete workers to disregard weather conditions and prolong the working season, so that ultimately provision will have to be made for heavier deliveries during the winter months.

The United States last year produced 1,884,044 tons of glass sand, valued at $1,606.640.

New Use for Old Pit

Someone has discovered a use for an old gravel pit.

What a lot of these abandoned pits there are all over the United States, some of them in locations where the city has grown up around them, placing them many times nearer the center of the municipality, and occupying really valuable ground.

The city of Flint, Mich., is the enterprising town which has discovered an advantageous use of these old pits, and the idea will no doubt spread to other towns.

Flint got the idea that it ought to have a municipal stadium. Then the Board of Commerce took up the matter, and began to look around for a site. That was when their eyes fell upon the abandoned gravel pit. It furnished them a natural site on which a stadium could be built with very little excavation. So the property was bought and the work will no doubt go ahead immediately.

The old pit covers a space nearly 400 feet square, and its possibilities for this purpose are so apparent to the citizens, since the idea has been suggested, that it is one of those things about which everyone says, "Why did we not think of it before?"

Aside from the fact that very little excavation will be needed, there is the added advantage that gravel for concrete can be secured right on the spot without hauling. In fact, the cost of the development will be insignificant compared with the ordinary stadium where a lot of excavation has to be done, and the dirt carted away and sand and gravel brought in.

SOME ITEMS IN RISING COSTS.

Remarks Before the National Association of Sand and Gravel Producers.

BY E. GUY SUTTON,
Carmichael Sand and Gravel Co., Williamsport, Ind.

How will costs in 1917 compare with costs in 1916?

I think there is no one but has an idea at least that our costs are going to be much greater in 1917 than in 1916, though the advance in prices began earlier than 1916. However, one item that I can mention and with which I think you are all familiar is that of fuel. In 1916 we contracted for fuel on the same basis that we got it in 1915, so that item for 1916 did not show much increase, though at the end of the season we were required to pay an advance on fuel because of the fact that we had to meet the commercial prices in order to obtain the fuel. In 1916 we paid $1.25 per ton for screenings, f. o. b. our plant. For mine run coal we paid $1.70. This year the best figures that I am able to obtain from reliable dealers will be $2.85 a ton for screenings, or an advance of about 120 per cent over last year, and $3.10 per ton for mine run, or an advance of 82 per cent.

We all experienced trouble in getting labor last year, because there seemed to be a spirit of unrest in the labor market, besides the actual scarcity. It was hard to hold labor even though we paid high prices, because the men hearing of higher wages being paid elsewhere would change, and this constant changing greatly affected their efficiency. Labor conditions, I believe, will be worse this year than last year.

Another item responsible for an increase in the cost of production, of 25 per cent, was the car shortage. Last year at our plant for various causes we lost forty days in a period of 225 days, and I believe that 70 per cent of that loss was due to car shortage. As far as the car situation is concerned, conditions are not going to be as good this year, I am informed by railroad officials, as last year, because of the fact that there will not be a general interchange of equipment, and some of the roads that are short on equipment are going to suffer. What are we going to do to meet those contions?

I might add that a 70-ton shovel that a year ago cost $9,750, today sells for $15,500. A boiler that we bought two years ago for $2,750 is quoted today at $5,500, or an advance of 100 per cent. We bought some hand-forged castings which cost us $2.50 a pound. Almost any steel or iron that we need has advanced from 50 to 100 per cent.

How are we going to meet these conditions? We cannot reduce the cost of production very much, but we can raise the price, and legitimately so, because we naturally are entitled to a fair profit. There is nothing, as I see it, to hinder us from getting a fair profit, and I do not believe it is the spirit of the government to say that we shall not. In fact, I think it is the desire of the present administration that all concerns make a profit, because the revenue that runs the government comes largely from that source.

I have here a clipping that is right along this line, and which took the form of a letter addressed by the president to E. N. Hurley, chairman of the National Chamber of Commerce, which reads as follows:

Your suggestion that trade associations, associations of retail and wholesale merchants, commercial clubs, boards of trade, manufacturers' associations, credit associations and other similar associations should be encouraged in every feasible way by the government seems to me a wise one. To furnish them with data and comprehensive information in order that they may more easily accomplish the re-

sult that they are organized for is a proper and useful government function.

If we are to be an important factor in a world's markets we must be more thorough and efficient in production. The encouragement of trade associations and the standardizing and installing of better cost accounting methods in our business concerns will go a long way towards accomplishing this end.

How many sand and gravel men keep an accurate cost record? I mean by that, not sitting down and merely thinking about it. How many balance off a statement at the end of a year, of their expenditures and their receipts, and know exactly what they got for their production? Until you do that you are not going to be able to make an intelligent price, and you are going to be bad competition for the people who do it. I would like to see us accomplish the standardization of an accounting system, so that we will all work upon the same basis, and put into our costs the same articles, so that we can make an intelligent comparison, and from that we can judge what our prices ought to be.

VALUE OF A BLASTING SHEET IN QUARRY BLASTING.

There are very few invariable rules that can be laid down for the use of explosives in quarry blasting. Much depends on the judgment and experience of the person using them. But long experience may not produce the best results if no plan is used to derive its full benefits. This is very often the case.

Explosives, considering their cost per ton of rock and their effect on other costs—such as drilling, breaking and loading rock in quarry, barring down in quarries operating on bench system, taking up bottom after shots that have failed to pull properly, etc.—constitute one of the most important features in operating a quarry. Still there is almost always less known about this important subject than anything else about the plant.

How many quarrymen know they are using the proper kind and grade of explosives, the proper method of detonation, that they are doing the proper amout of drilling, neither too much nor too little? How many failures or poor shots have they had that they have never fully accounted for? It is not every quarryman that could give as a reason for using a certain kind of explosive, and the method of using it, that they together produce his stone for him at a cost below what anything else on the market can do, and have never given him any trouble.

Some operators rely on the initial cost of an explosive to give them low costs and not upon the proper selection as to kind and grade or proper method of use, too many assuming that if dynamite is put in a bore hole and is exploded, that is all there is to it.

There are a great many different kinds and grades of explosives manufactured, each possessing certain characteristics, and there are a number of ways of detonating and using them. As different explosives and different methods produce different effects, it is evident that one particular explosive and method of use is better adapted for a certain class of quarry work than all others. Experience would soon show this. Why is it then that we see a number of different kinds, grades and methods, used in the same material when same results are desired? Evidently some are not getting the best results that can be obtained in their operations.

It frequently happens wherever explosives are used in considerable quantities, that certain difficulties or troubles are encountered, as failure of shot to entirely detonate or produce desired results.

Now then, are quarrymen to properly use their own experience, and take advantage of the experience of the explosive manufacturers to obtain better results, by using the right kind, and grade of explosive, and methods, and by overcoming difficulties in its use? Low costs are obtained in any up-to-date manufacturing plant by keeping complete cost and performance records of what is being done, and studying and comparing these records. If it is important, in studying costs in any manufacturing operation, to keep exact cost and performance records, it ought to be equally important, if not more so, in the use of explosives.

A cost per ton at the end of each month or year is hardly adequate, but there should be kept what is generally spoken of as a blasting sheet. This method of recording the use, and the results obtained from the use of an explosive, is being used to some extent by the large operators, but it has found very little use among the smaller plants, and should be used by every quarry.

The blasting sheet is a drawing, preferably to scale, showing the number and location of each bore hole, their depth and diameter, how far they are spaced apart, and the burden at the top and bottom of each hole, the kind and grade of explosive used, and the amount of charge in each hole, also the amount of tamping used. The kind and number of detonators should be shown, and where they are placed in each charge, the amount of water encountered, and length of time the charge remains in it. It is also well to note the condition of the explosive, and the structure and nature of the rock, that is, if the explosive is well thawed, soft or hard, fresh or old stock, etc., and any unusual structure in the rocks, as seams, slips, crevices.

With the burden at top and bottom of each hole given, the average burden can be computed. This, with the depth of the holes and their spacing, will give pretty accurately the cubic contents of shot or weight in tons.

After the blast is made, information should be placed on the sheet as to how the shot pulled, how it was thrown out, and the condition of the rock as to fragmentation.

The total amount of explosives used, figured against the tonnage in the shot, will give the cost per ton, or tons of rock produced per pound of explosives. If the cost of drilling the shot and cost of labor loading are also shown, a pretty accurate statement is now had of just what the explosive is doing.

A study and comparison of these sheets will usually show where improvements can be made, both in kind and grade of explosives used, and in method of use. And they will enable the quarryman to go about making any changes intelligently, and will show him exactly what they will result in. Furthermore, in quarries where blasting sheets are kept and used, very few poor shots or failures are had, and if one is encountered the cause is usually apparent and never need be repeated, and the blame not placed where it does not belong.

Changes that show an improvement in the use of explosives are being worked out all the time, as for example, the recent extensive change from nitroglycerin and gelatin to the ammonia grades for quarry work, and the tendency from the quicker grades to the slower ones for this same class of work. New methods of detonation are being studied and adopted, as for example, the increasing use of No. 8 detonators over No. 6; also the use of delay action detonators where conditions demand them.

If a quarryman is keeping a record of his blasting in the form of a blasting sheet, the more apt he will be to recognize the value of these changes

and improvements, and take advantage of them in the right way.

To illustrate this point, there is the experience of the Harris Granite Quarries Company, Salisbury, N. C. This company operates a number of plants getting out jetty rock, paving and durax paving blocks, monumental stone, and crushed stone, two of their plants being devoted exclusively to the production of crushed stone. Explosives constituted quite an item to them, and they always tried to get their costs at the lowest possible figures, but recognized that it was considerable of a problem.

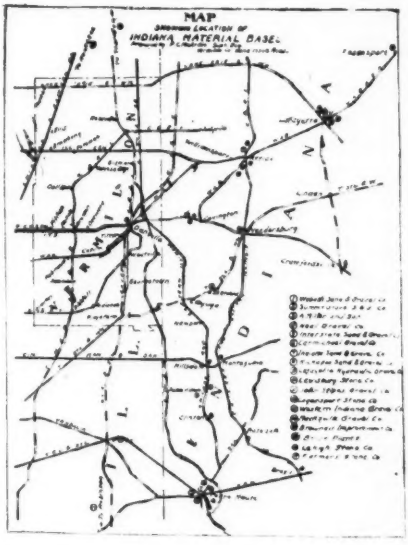
Their two crushed stone plants, Stacy plant, at Ruffin, N. C., and American plant, at Salisbury, N. C., are both operated in granite, very hard and homogenous rock, having no natural cleavage. They operated both quarries on the bench system, using tripod steam drills, drilling a 16 to 18-foot bench. At their Stacy plant they used a very wide spacing of holes, with large burden, making it necessary to "spring" each hole.

This system gave them satisfactory results, and they never experienced any poor shots. At their American plant at Salisbury, N. C., this method apparently would not produce the satisfactory results obtained at the Stacy plant, and a very short spacing of the holes, with relatively light burden, was used. Results from this method were not entirely satisfactory to the management. They varied too much without their being able to get at the cause.

During a trial of an explosive at this plant, blasting sheets were made of these shots, which showed them very conclusively the superiority of this explosive over what they had been using. These sheets also showed them wherein certain changes could be made in drilling and loading that would result in a further decrease in cost, and in addition to this is was explained to them how these sheets could be used, to figure the correct charge for each shot, to guarantee good results on each shot, by referring to sheets of past shots, and avoiding conditions or methods that produced results that were not satisfactory, and also how they could be used as a check on the foreman, to show if he was doing as directed, or using proper judgment in his work.

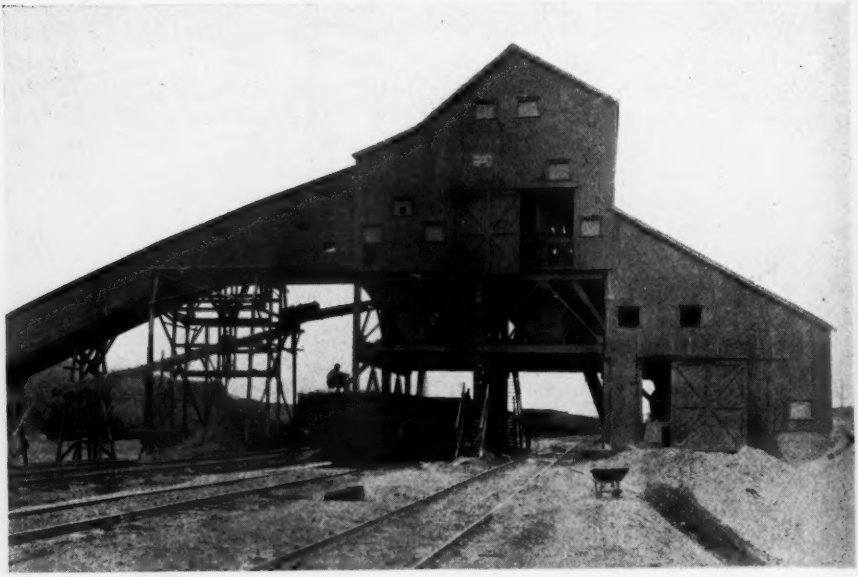
Map Shows Location of Deposits.

In a few localities where extensive systems of road construction are being planned, the method has been adopted of preparing a map to accompany the specifications and call for bids, showing the location of all material supplies available together with railroad connections.



The contractor is thus supplied with a list of producers from whom he can secure material, their location, the distance from the work, and the method of transportation by which the materials must be delivered.

One such map prepared by the county highway engineer of Vermillion County, Illinois, is shown herewith.



Plant from the East. Belt Conveyor Gallery at Left. Crusher House at Right. Dirty Water Flume at Left.

UNIQUE SAND AND GRAVEL PLANT IN INDIANA.

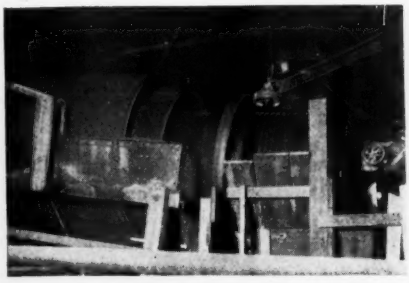
BY FRANK M. WELCH AND MINER RAYMOND

A short distance southwest of the campus of Purdue University in Lafayette, Indiana, there stands a gravel and sand plant that in many ways is a departure from established custom. While there may be plants with larger daily output—2,500 cubic yards in ten hours—it is probably the largest plant in the industry without bin storage except for small hoppers which hold only enough to allow shifting of cars. In this feature as well as in external appearance the plant closely resembles the three-track coal tipples such as are seen along the railroads which pass through the bituminous fields of Kentucky, Tennessee and West Virginia. In effect, the plant uses railroad cars instead of bins.

The plant is the newest of those owned by the Western Indiana Gravel Company of which Mr. M. A. Neville is president and general manager and Mr. F. D. Coppock is vice-president and assistant general manager. These men with their associates have put into this plant the experience gained in building and operating seven other plants, all of which are now in steady operation in Ohio and Indiana. They learned long since that the greatest profit-destroyer that sand and gravel operators have to face is the frequent shut-down due to inadequate or poorly adapted machinery, and therefore the plant under discussion was designed and built with the primary idea of minimizing the frequency and length of inoperative periods. To accomplish the former, no stone was left unturned toward making every wearing part as heavy and as hard as is practical; and to reduce the latter, extra parts are on hand for repairing the units most liable to wear and tear, and ample walks and stairways give easy access to every piece of machinery. A combined blacksmith and machine

shop is maintained at the plant for handling quick repairs and alterations.

Material is excavated by a steam shovel and loaded into trains of side dump cars and thrown into a large hopper from which an automatic feeder delivers it at a uniform rate to a

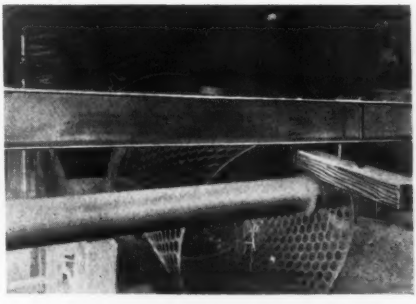


Side View of Gravel Screen Running.

30-inch belt conveyor for which the Maine Belting Company furnished the belt. The belt discharges the material into a 5-foot (inside diameter) triple-jacketed revolving screen which separates the bank run into sand and three grades of gravel, the oversize going to a No. 6 McCully gyratory crusher. The crushed stone now enters the big elevator which has 27-inch wide by 14-inch projection continuous buckets made of 3/16-inch steel and mounted between two strands of 18-inch pitch steel bar roller chain, having ⅜x3½-inch side bars and 6-inch single flanged rollers with case hardened bushings at each articulation point. In this elevator the stone is carried up about 60 feet and discharged into a second triple-jacketed screen whose inner cylinder is 4 feet in diameter, and here the several sizes of crushed stone are separated, with the stone dust eliminated and the oversize going to a 36-inch Symons disc crusher to be re-elevated and rescreened by the same equipment.

All material is thoroughly washed, a 10-inch Erie centrifugal pump furnishing between 2,000 and 3,000 gallons per minute to long spray pipes extending the entire length of the inside of both screens. The dirty water from the gravel screen carries the sand with it to a settling tank where clean sand is produced. Another unique feature of this plant is that the washing water is successfully used over and over, only about 10 per cent makeup water being required. This is accomplished by the use of a large reservoir, into one end of which the dirt-laden water from both screens is sluiced and allowed to settle and clean itself while clean water is being pumped from the other end. This continues until the one end is filled up with sediment, a process which will require several years according to the experience of the operators; but whenever it becomes necessary the filled-up end is dredged out and the intake and outlet ends of the reservoir reversed, the newly-dredged portion now serving as the former.

The building which houses the crushing and screening operations is



Looking Into the End of the Gravel Screen.

of steel construction throughout and enclosed in a galvanized corrugated steel housing with large sliding doors on the main and second floors. Above the doors are steel cantilever beams to which block and tackle or hoists may be attached. There is a steel trolley over both crushers and practically every unit is controlled by an independent motor. These items serve to

show further that the men behind the project have learned that it pays and pays well to build substantially and to be prepared for emergencies.

The plans were worked out by the officers of the Western Indiana Gravel Company in collaboration with the engineers of The Webster Manufacturing

Belt Conveyor in Galley from Hopper to Screen. The Boy Picks Out Impurities.

Company who designed, furnished and erected all of the steel work and machinery with the exceptions noted above.

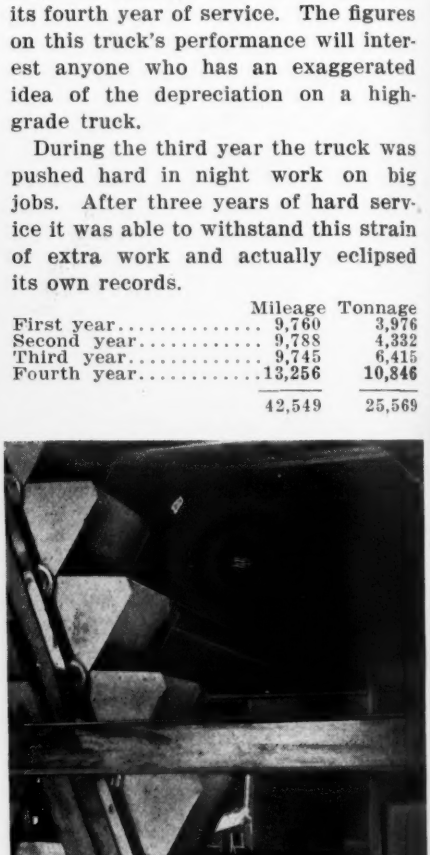
Pittsburgh Concern Uses Trucks

The Rodgers Sand Company of Pittsburgh, Pa., has used motor trucks for delivery for more than four years. Counting all items, including depreciation and labor, they figure that a 5-ton Pierce-Arrow truck costs $20 a day to operate and maintain. Each of their Pierce-Arrows displaces five teams, each of which cost the Rodgers Sand Company $5.00 a day to operate. The saving effected by each truck in replacing five teams is therefore $5.00 a day or 20 per cent.

Their first truck, a 5-ton Pierce-Arrow, ran a bigger mileage and carried a greater tonnage than ever before in its fourth year of service. The figures on this truck's performance will interest anyone who has an exaggerated idea of the depreciation on a high-grade truck.

During the third year the truck was pushed hard in night work on big jobs. After three years of hard service it was able to withstand this strain of extra work and actually eclipsed its own records.

	Mileage	Tonnage
First year	9,760	3,976
Second year	9,788	4,332
Third year	9,745	6,415
Fourth year	13,256	10,846
	42,549	25,569



Elevator from Crusher to Stone Screen.

The Rodgers Sand Company feels equipped to handle any job with the trucks. They have frequently worked them all night in order to finish a rush job on contract time.

WORKING QUARRIES IN SEVERAL LIFTS.

BY DANIEL J. HAUER.

Quarry operators, as a class, are progressive men.

To anyone who has made a study of quarry methods, the great progress made during the past decade is indeed quite surprising. Machinery of all kinds has been employed to reduce the cost of producing stone, and wonderfully efficient crushing plants have been designed and installed for the leading crushed stone quarries of the country.

In many of these quarries, in spite of new methods and machinery, one old idea has been followed since quarries were first developed in this country. This is the working of the ledge in one lift or level. There are few exceptions to this.

Recently the writer visited a large crushed stone quarry in eastern Pennsylvania where the breast of the ledge varied from about 75 feet to nearly 100 feet in height. This ledge was being worked in one lift. Thus, although the overburden was light, there was always some stripping to be done. As some of the overburden was carried to the quarry floor in blasting, the cost of handling this made a varying cost in each day's work, according to the amount of dirt handled.

The different height of the ledge from day to day meant that the drilling cost would vary according to the method of drilling, as well as the varying depth of holes. As this work would go up or down in cost, so would that of explosives. As the blasting would vary from day to day and week to week, it would mean that the sizes of boulders thrown down would also vary, thus causing the cost of breaking and crushing the rock to run far from uniform. It was also noticed that on some days there was a shortage of rock, due to waiting on large blasts or toeing up the breast. Thus the crushers were not always run to their full capacity, causing even the cost of crushing to vary.

As the ledge ran back from the quarry face it increased in height, so that within a year or two the breast will run close to 125 feet high.

Now it can be seen that if this quarry were worked in three lifts, none of the costs would vary much from day to day or week to week. An economical lift for most quarries is from 30 to 40 feet.

Let us take it for this case as 35 feet. Thus at present this quarry could be worked in three lifts or levels, the first two being 35 feet each, making a total of 70 feet. At present this would give a height for the third lift of about 25 feet. This would be increased during the next few years as the ledge is developed deeper.

It can be seen that the top lift would vary as to costs of working it, both in drilling and blasting, as well as in stripping the overburden and in mucking up the stone.

The cost of all the work on the other two lifts should remain constant, the costs in the second lift being slightly higher than in the first. It can be seen that for each of the lower lifts a systematic method of drilling and blasting can be worked out. After but little experimenting, the spacing and drilling of holes can be repeated on a prearranged plan and schedule. Almost identical results can be obtained from each blast. The charges can be gauged and arranged to break up the rock for economical handling. The cost of mucking should not vary. The crushers should be worked to their full capacity, for rock could be furnished from three faces instead of one.

A quarry worked in this manner should give very uniform costs, as practically the only variation will be on the top level, and this would give

less than one-third of the production.

It becomes evident that if there is a large demand for crushed stone and the price is high, the quarryman can afford to push his top level or development work. If prices go down and there is a decreased demand for stone, then the lowest lift, or two lower levels, can be worked at a minimum cost, allowing a profit to be made under adverse conditions.

The whole matter is not one of theory or speculation, but is based upon actual experience. This method is applicable to many kinds of quarries.

SOME BENEFITS OF LOCAL CO-OPERATION.

4/22

At the recent meeting in Chicago at which the organization of the National Association of Sand and Gravel Producers was effected, a number of men took occasion to tell of the benefits of co-operation in their own local fields. The following extracts along this line are made from the proceedings:

Frank D. Bradley, Toledo, Ohio: "I have been in the sand and gravel business for some time in Toledo. We have a pretty fair local organization. We all found out that our competitors are much better fellows than we thought they were. I believe in the work of local associations, and we ought to try to form some kind of a national association. If we can come together once or twice a year we can stimulate local interest in the different territories. A lot of stuff is sold too cheap, and it would not hurt anybody if the price was advanced so there was a reasonable profit in the business. It would not materially decrease the amount of sand and gravel consumed."

Geo. V. Miller, Indianapolis, Ind.: "Our organization in Indiana grew out of local conditions in Indianapolis. The first few years we were in the gravel business we spent our time fighting our competitors and learning to hate them. Finally we called a meeting and decided to organize the five local producers doing a carload business, and the organization was confined to the carload men. Indianapolis has one or two other firms who do strictly a wagonload business. I think we have as good a local organization as might be found anywhere. We are very friendly now, exchange materials with each other, and if one of us gets behind on deliveries and another can help out, he does it. After about two years we got the producers of the state together at a meeting in Indianapolis, and while our organization is very young, we are doing a great deal and have much better conditions. Recently we divided the state into five districts. It is the idea that these districts will be represented by our executive committee, and the local conditions that the state committee cannot reach, will be reached by that of the district.

"We all know it is necessary in this time and age to organize. I know that many producers in Indiana are selling material for less than cost. Sometimes they are getting a fair price in their own district, and then go into the territory of a competitor and sell for less than cost. We should get together in some form to cut out these wrong conditions."

H. Donnelly, Cincinnati, Ohio: "We have an association called the Sand and Gravel Producers' Association which was organized about a year ago. There were fifteen gravel competitors and fifteen sand competitors, making about thirty people coming into competition. Previous to the organization there was much hard feeling, and in Cincinnati about a year ago gravel was being sold at 50 cents a ton, allowing 32 cents per ton freight rate. It was first necessary to establish confidence before an association could be organized, but we were finally able to

bring about an organization. We compared costs on screens and crusher parts, and steam shovel parts, and made out a list and presented it to the members at the first meeting. It showed that we were paying an increased cost over a year ago of all the way from 50 per cent to 200 per cent. In addition we had to stand a 25 per cent increase in the cost of labor and we now have facing us a 100 per cent increase in the cost of coal. No one was allowed to undersell, and that banished all ill feeling as to who did or did not get a particular contract. There were not two orders sold in the city of Cincinnati at less than the market price last year. It was decided by the association that inasmuch as freight charges were based on tonnage, carload material would not be sold by the yard, and a ton price was established, which is being rigidly adhered to. Five cents per ton was figured to the cost of sand and gravel to allow dealers a commission, and five cents more to take care of the discount which is allowed customers who pay their bills within fifteen days. I do not believe a better working arrangement can be had, and everybody is perfectly satisfied. I do not believe there is a member of our association who would go back to the old conditions, even if he did not get half the business. We are now getting 10 cents a ton additional between December 15 and March 15 for handling business in the winter time. We have discontinued the use of salesmen, the major portion of the business being done with the dealers over the 'phone. The car shortage is a serious factor. If the car situation is going to be anything like it has been in the last sixty days we will want $1.50 per ton for our material."

O. S. Stepanian, Columbus, Ohio: "Last July we managed to get together, and there are six companies in our local association. We have just started a discount system of 5 cents on each yard where bills are paid before the tenth of the month. We have a paid secretary, who is the secretary of two other associations also. He prepares a list each month of the contractors in the city, and keeps data as to how they pay their bills. This enables our members to keep a very good record of the various contractors and their ability to meet their obligations. Through the association the members have been in better position to ascertain the costs of production and to make prices accordingly. We also have a basis of exchange and competitors are now helping one another out when help is needed. The association divided the city into zones of one mile each, and the cost of hauling is graded accordingly, a charge of 20 cents per cubic yard per mile being made; the minimum charge is based on a mile haul. The plants of the different competitors are centrally located, and one has little or no advantage over another. The zone system of distribution has also been adopted by the local builder's supply association."

Officers for the new national association were elected as follows:

President, H. Donnelly, Miami Stone and Gravel Co., Cincinnati, Ohio.
Vice-president, Walter F. Jahncke, Fritz Jahncke, Inc., New Orleans, La.
Secretary, E. Guy Sutton, Carmichael Sand & Gravel Co., Williamsport, Ind.
Treasurer, F. W. Renwick, Chicago Gravel Co., Fisher Building, Chicago.
Directors (one year)—J. L. Sheily, St. Paul, Minn.; Milton McDermott, Knoxville, Tenn.; C. R. Nutt, Plymouth, Wis.
Directors (two years)—W. R. Webster, Mason City, Iowa; J. S. Westra, Grand Rapids, Mich.; B. H. Atwood Chicago, Ill.

The Whitehouse Stone Company of Toledo, Ohio, has increased in capital from $60,000 to $100,000.

Incorporation papers have been filed for the Repton Sand Corporation of Richmond, Va. The company has a maximum capital of $50,000. John Mitchell, Jr., is president and D. P. Bragg secretary, both of Richmond, Va.

A CALIFORNIA PLANT IN DETAIL.

The California Building Materials Company has a gravel plant of considerable interest located in Alameda County, California, some distance out from the city of Oakland, where nature has deposited upon the floor of the great valley through which the Alameda creek surges, for untold ages. a bonanza deposit of gravel. This gravel deposit has been submitted by nature to heavy and continued attrition and erosion and is the selected material of the basaltic range drained by the streams, the softer stone having been disintegrated and removed by the action of the water, leaving only the most perfect nodules of the country rock.

This plant is described in detail by E. M. Porter, C. E., in a recent issue of the Architect and Engineer of California.

It is the first plant to be placed in operation on the Pacific Coast with a slack line cable excavator system instead of the old type steam shovel with cars and locomotive. Figures No. 1 and No. 2 show side and rear elevations of the tower on which certain parts are arbitrarily sectioned to clear the illustration.

From the foundations at railroad grade to the excavator hoist is approximately 105 feet. From the sheave wheel located above the hoist the single 1⅝-inch steel track cable reaches across the river for a clear span of 900 feet. Suspended from a four-wheel special carriage that runs on this flexible track is a steel bucket of two cubic yards capacity, which digs and conveys to the receiving hopper all the river gravel that the plant uses.

In starting the excavator work, the field anchor was laid down in the farthermost corner of the property on the opposite river bank. The excavation was about 95 per cent under water, for quite a stream was flowing when the plant was completed in June of this year. The greatest depth reached in the first cut was sixty feet, at which the deposit appeared to be a mass of large boulders. Owing to

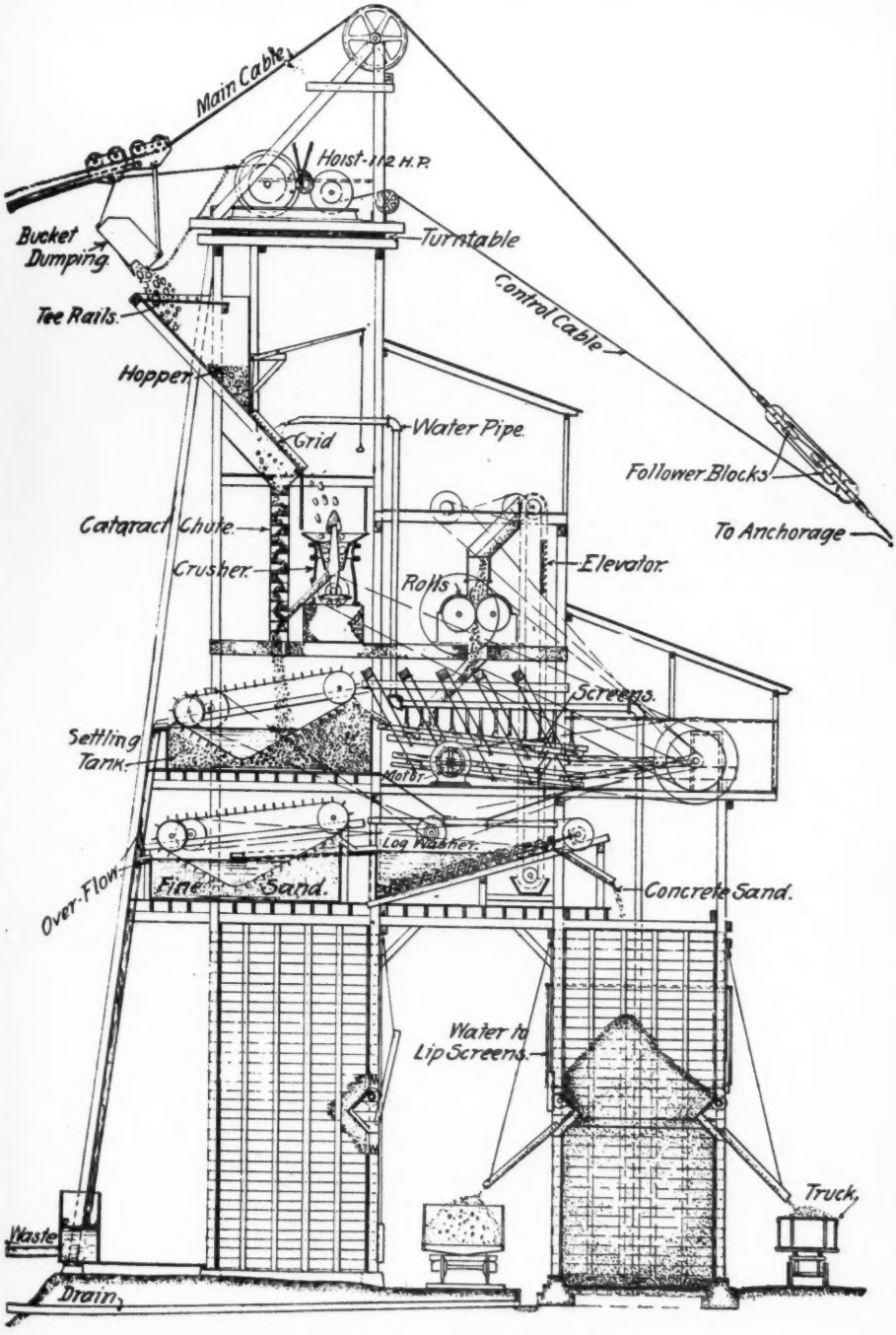


Fig. 1—Side Elevation of Plant

the water, exact conditions could not be determined.

"Slack cable excavator" signifies that provision is made to lower and raise the track line according to the working requirements. In other words, the track cable is strained up tight when the bucket is in dumping position, as in Figure 1, and slacked off again as the bucket returns to the pit and is let down for loading. The complete cycle of loading the bucket, raising the track, traversing to the tower, discharging the load and returning again can be made 30 to 35 times per hour, delivering, in average digging, two cubic yards each trip.

The speed of operation is possible on account of special features of hoist and bucket. The latter, known as the manufacturer's type "H," has been recently patented. It loads satisfactorily and no time is lost in discharging the load, for that is done by a continued strain on the hoist line after the carriage has reached a dump block, securely bolted to the track cable over the hopper (Fig. 1). On the instant when the forward drum is released the bucket begins the return trip and automatically takes position for digging or carrying.

The forward hoisting drum used for bucket movements turns free upon the shaft and through two different sets of gears it is connected to a General Electric motor of 112 H. P. At each end of the drum is a powerful band friction, one on the high speed gear train and one on the lower speed. The loading speed is 200 feet per minute, and the traversing speed when bucket is clear of ground 800 feet per minute. The illustration shows the track cable passing over a 72-inch sheave at the tower and terminating at the pin of a two-sheave follower block. This block, in connection with the three-sheave block (solidly anchored to the ground), a ¾-inch cable and the rear drum of the hoist, furnish the means of holding any desired safe tension in the track cable and of quickly making trip adjustments.

The hoist floor rests on an anti-friction turntable and is movable in a horizontal plane about a fixed center. It is therefore comparatively easy to turn the hoist in any direction desired in working over a gravel property.

River gravel is dumped as shown (Fig. 1) into a hopper from which flow is regulated by a vertical steel gate. A small amount of water admitted to the hopper through a 1½-inch pipe insures rapid movement of gravel even when considerable clay is present. Boulders larger than ten inches are retained on a cross grid of "T" rails shown near the top of hopper, where they are easily disposed of by sledging.

The hopper gate is under control of one man, who regulates the feed and averages each two-yard delivery over an approximate excavator trip period. Passing the gate, all materials fall upon a grid, built of round bars, having effective openings about 2½ inches square. This grid is inclined at an angle of 40 degrees to the horizontal and is supplied with an ample flow of water, which carries through the cross bars all sand and small gravel, together with its content of clay and loam, into a cast iron cataract vertical chute, down which it flows with a zigzag motion. Each 12-inch section of the cataract resembles a box with one-half of the bottom removed. In assembling, each box is set in reverse position with regard to the next section, forming the construction shown sectionally in Fig. 1.

Near the floor of the crusher room an opening in one section of the cataract chute admits crushed material from the gates No. 5K gyratory. The crusher is fed by all the gravel passing over the iron grid which terminates just above the bowl.

From the primary settling tank waste water carries much of the loam

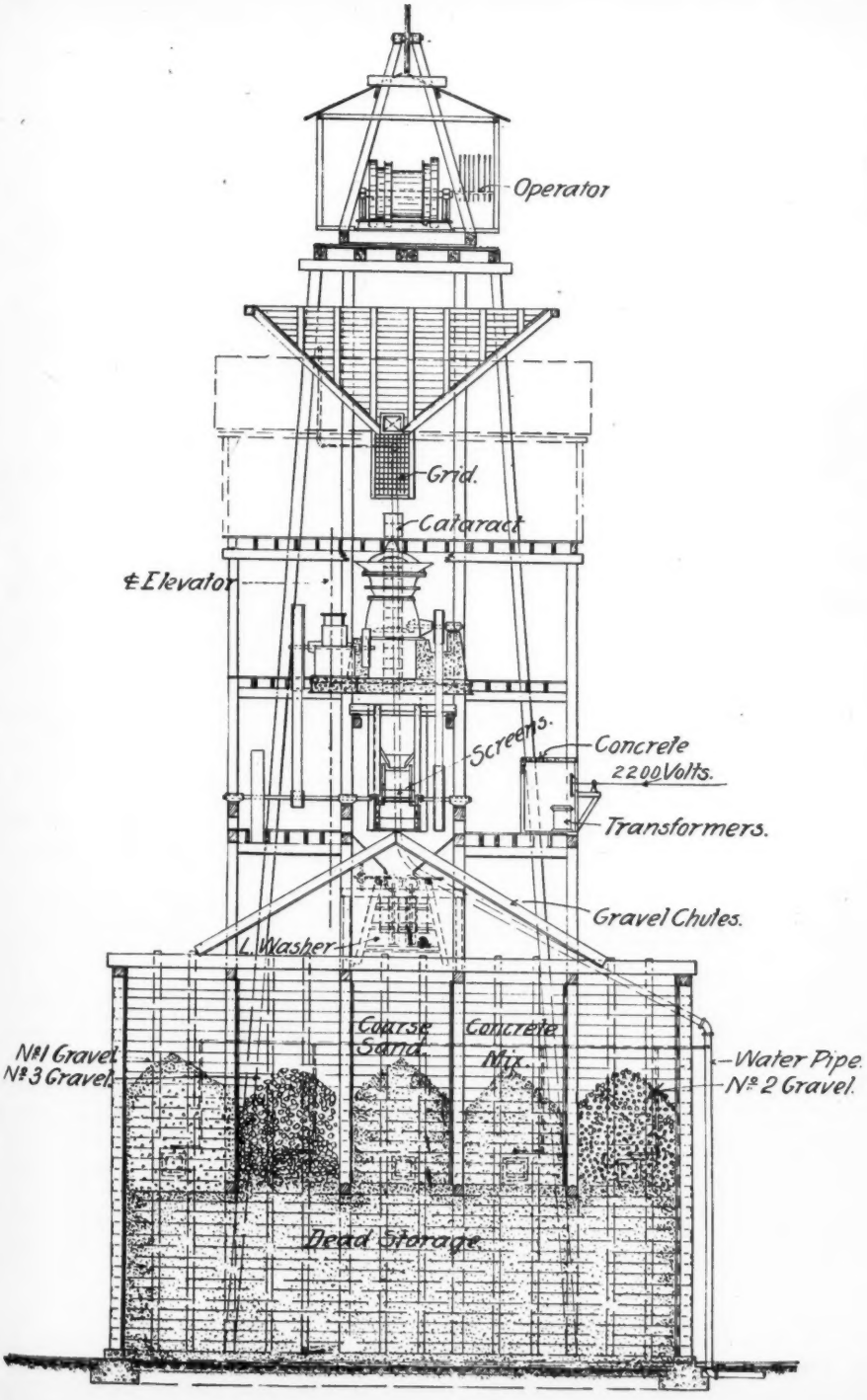


Fig. 2—Rear Elevation of Plant

and soluble clay, but all material except the soluble portion is removed by a steel flight conveyor, and discharged onto the head end of a four-deck "Parrish" shaking screen.

The net screening surface of the top deck is 2 feet 8 inches by 15 feet 6 inches, and through a well-distributed jet system this area is deluged with clean water at the rate of 1,000 gallons per minute, globe valves regulating the quantity of water furnished to any section of the screen.

The screen shaft, turning 170 r. p. m., gives to each screen plate a total travel of 5 inches forward and 5 inches back for every revolution. The crank centers are paired and oppositely located, making a balanced operation.

The plate perforations in the top deck screen are 1¾ inches diameter, the next 1⅛ inches, then ½ inch, and in the bottom deck is one section of 1/10 inch, followed by three sections having 5/16 inch perforations.

This graduation selects a finished material very accurately sized. From the top deck delivery we have the rejected over-size gravel ranging from 1½ inches to 2½ inches. Rejects, largely flat round discs that have slipped edgewise through the crusher without breaking, are returned by the vertical bucket elevator to the 36-inch reducing rolls.

From the second deck delivery we have 1½-inch stone; for this material will have passed through 1¾-inch openings and is rejected by 1⅛-inch openings.

In the same manner we have 1-inch stone from the third deck and ½-inch stone from the bottom deck, going from the screen direct to the respective bins.

Through the bottom deck all sand passes to one of the two final washers. The finer grade, used for plaster and mortar, is selected by the first section of this screen having the smallest openings and with part of the water goes to a settling tank arranged just like the primary tank but of much smaller capacity.

The coarse concrete sand passes through the 5/16-inch holes to a standard twin screw "log washer," from which it is delivered to the sand bin. Means are provided to divert all or any desired part of this sand to an adjoining bunker set apart for the commercial product, "Concrete Mix."

Water flowing from the "log washer" was found to carry some of the finer grade sand and was turned into the final settling tank, where it has a better chance to settle. Waste water leaving this final tank carries in solution all the loam that escaped the previous processes. The fine sand is conveyed from the tank to the large bin just below the floor.

Absence of wooden floors in the storage bins imposes the vertical load directly upon the ground, inside the limits of the foundation walls. For loading railroad cars and automobile trucks a cast iron gate, with suitable swinging steel chute, is located in the center of each bin. The entire space from ground level up to this available storage point is therefore a "dead storage."

The bin walls are stayed in both directions by truss rods on approximately 4 foot 6 inch centers.

The preparation machinery requires two men, one at the gate lever near the crusher and one who is generally found on the screen floor in convenient reach of the motor and pump switch.

Employment is found for one other helper, whose principal duties are sledging boulders at the dump, dressing cables, oiling and getting supplies. The car loading, as stated before, is done by the locomotive crane, which carries a crew of two men.

In accordance with the policy generally followed, a ground storage for 100,000 tons is provided adjacent to the railroad sidings on both sides of the plant.

The extra cost of twice handling

storage material is offset by gaining a very flexible means of meeting the market demands for tonnage of any sizes in excess of daily plant production.

For electric power the 60,000-volt transmission lines of the Pacific Gas and Electric Company lead to a transformer house set apart from the main building, where the current is reduced to 2,200 volts.

The mill motor, operating screens, crusher, rolls, etc., is 75 H. P. constant speed, wound for 2,200-volt service. The excavator motor operates on 440 volts, the reduction being made in oil transformer located on the screen room floor in a special concrete enclosure, shown clearly on Fig. 2. Although the wells and the centrifugal pump furnishing wash water are located approximately 400 feet from the plant, the starting switch for the pump is just outside the transformer house in the screen room.

The entire plant, including the slack cable excavator, was designed by and built under the supervision of Mr. A. D. Hadsel, vice-president of the Cable Excavator Company, Philadelphia.

Shame on You!

A Gravel producer in one of the big cities was recently convicted of selling short measure.

The charge on which he was found guilty was brought by the city, and other cases are pending.

Goodness, man! Don't you know that business is not done that way any more?

Builders' Sand & Gravel Company, Chicago, has incorporated with a capital of $50,000. The incorporators are James T. Habiland, Adrian L. Hoover, William F. Waugh.

At the directors' meeting of the F. W. Menke Stone & Lime Company, Quincy, Ill., the following officers were elected: G. W. Menke, president; D. F. Metzger, secretary; F. C. Menke, treasurer.

Clarence L. Pratt, brother of L. H. Pratt of Tulare, Calif., is extending his sand and gravel business. He is president of the Pratt Building Material Company with offices in San Francisco, and his company has just purchased the sand plant of the E. B. and A. L. Stone Company in Sacramento. Mr. Pratt expects to improve and enlarge this plant. The company now ships sand and gravel from Alameda, Monteray, Solano, Sonoma, Sacramento and Yuba counties.

The Richmond Gravel Company, Richmond, Ind., has increased its capital stock from $10,000 to $35,000.

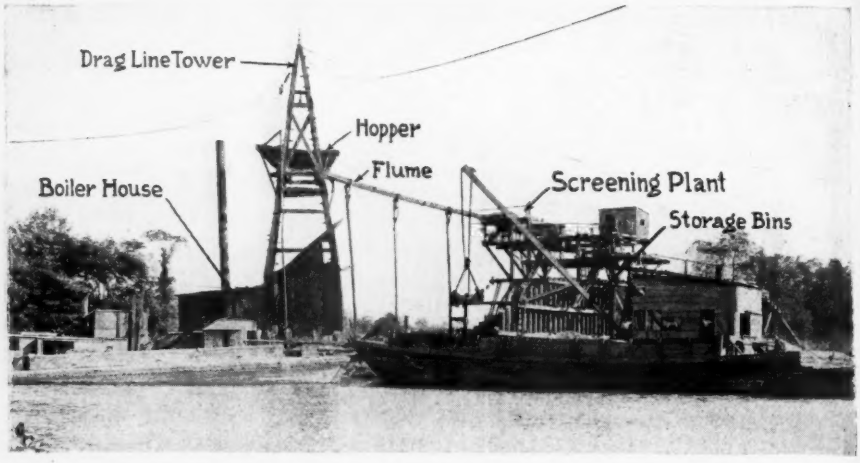
The state highway commission of Oregon is bargaining for a gravel or rock pit at Wilbur, Ore., probably for use on state roads, if some of the present road measures pass the legislature.

The McLaughlin-Cook quarry property, Kankakee, Ill., was sold at auction at foreclosure sale to A. E. Cook for $4,623, the amount of the mortgage and court costs. Mr. Cook bought in the property to protect his investment. There were no other bidders.

The Vicksburg, Alexandria and Southern Railway, which connects the gravel plant in the pine woods north of Alexandria, La., with Alexandria, was bought recently by the Tioga Gravel Company. This company will operate it, having paid approximately $150,000 for the road.

The gravel plant of Horton & Horton on the Colorado River, Houston, Texas, has been moved further down the stream. They ship eleven cars or more per day, and in the new position have gone down 30 feet into the bed of the river and not yet exhausted the supply of gravel.

A new model gravel plant is being erected by C. E. and C. W. Wood, on their ranch property at Los Banos, Cal. It is expected that the plant will be ready for operation by the first of April, at which time the various sizes of washed gravel will be ready for delivery. The major part of the hauling of materials will be done by motor trucks, in the finest prepared condition for construction purposes. The San Joaquin Light and Power Corporation have started construction on the line.



General View of Plant, West Jersey Sand & Gravel Co., Westville, N. J.

Many Sizes at Small Expense.

A representative instance of what can be done in securing four or five sizes of cleaned products with a small expenditure for machinery is given by the installation of the West Jersey Sand & Gravel Corporation, of Westville, N. J.

The original plant was a drag line tower which discharged directly into barges. To increase the capacity, a flume, with screens and separator, were installed, the new plant washing and screening the sand. The hopper was left in its original position, a large drag-line shovel was added, and the material flumed from the hopper to the screening plant by means of a jet of water. The illustrations show the plant as remodeled and improved. H. B. Pratt, Philadelphia, was the engineer, the improvement being made by the Link-Belt Company, Nicetown, Philadelphia.

The screening plant comprises three Gilbert type screens, which are so located that a duplicate set can be installed later. They are placed over three ground storage bins, which were made by building two partitions, thus getting three sizes of product on the ground. These screens are operated by Link-Belt drives from a small steam engine situated on top of the bins. The sand and water are separated by a counterweighted settling box, the Link-Belt sand separator, mounted on a small wooden tower.

The material in the ground storage piles is picked up and reclaimed by a mast-and-gaff outfit, which either builds out the storage piles for further capacity, or loads direct to the scows.

The plant is operated by four men —one in the drag-line tower, one man in charge of the screening plant and engine, one fireman and one man on the mast-and-gaff outfit.

The capacity is approximately 600 yards in 10 hours.

The entire plant is run by a 100-horse power boiler. The water is elevated and delivered to the screens and flume by a two-cylinder steam pump, and, except for an occasional cleaning out of the fine mesh screen to remove pebbles that lodge in it, the equipment from the hopper to the sand piles requires no attention.

The use of ground storage bins in connection with a mast-and-gaff outfit, or locomotive crane, is a very economical way to equip a plant of this kind, as the amount of storage available is practically unlimited.

Co-operation Among Wisconsin Producers.

Plans for collective purchasing of equipment and supplies, and the facilitating of state aid work were two of the co-operative features planned at the recent annual meeting of the Wisconsin Crushed Stone Association held in Milwaukee. The organization, with a membership of fifteen firms who operate numerous quarries throughout the state, has its offices in the Pereles Building, Milwaukee.

Because of the increased cost of equipment required for operating their quarries the association has under serious consideration the plan to establish a purchasing agency that will buy for all the members as for one, and distribute the stores as required to the members.

The association as a body pledged itself in a manner that will guarantee the prompt completion of all state aid work. Where any company fails for any reason to complete its allotment of state aid work the association binds itself to finish such work.

At this meeting all officers were re-elected, as follows: President, A. J. Blair, Lake Shore Stone Company, Milwaukee; vice president, J. J. Sloan, of the Wisconsin Granite Company, Chicago; secretary, R. W. Scherer, formerly with Trap Rock Company, Minneapolis; treasurer, Leathem D. Smith, of Leathem D. Smith Towing & Wrecking Company, Sturgeon Bay, Wis.

The association, which is organized to promote the use of crushed stone, numbers among its membership the Badger Crushed Granite Co., of Chicago; Davis Bros. Stone Co., Lannon, Wis.; F. E. Gissel Quarry Co., Lannon, Wis.; Lake Shore Stone Co., Milwaukee; Leathem D. Smith Towing & Wrecking Co., Sturgeon Bay, Wis.; Lutz Stone Co., Oshkosh, Wis.; Mayville White Lime Works, Mayville, Wis.; Nast Bros., Marblehead, Wis.; Sheboygan Lime Works, Sheboygan, Wis.; Trap Rock Co., Minneapolis, Minn.; Union Lime Co., Milwaukee; Universal Granite Co., Chicago; Universal Crushed Stone Co., Chicago; Wauwatosa Stone Co., Milwaukee; Wisconsin Granite Co., Chicago.

Iowa Association Formed.

A new state organization has been formed of sand and gravel producers who attended the short course at Iowa State College, Ames, Iowa.

The organization is to be known as the Iowa Sand and Gravel Association, and has the object of securing better concrete materials through the co-operation of the engineering department of Iowa State College.

S. H. Brown of the Lake View Sand & Gravel Co., Lake View, Iowa, was elected president; R. C. Fletcher, Des Moines, vice-president; W. R. Webster, Mason City, secretary, and A. D. Finch, Sabula, treasurer.

Results of research and experiments in sand and gravel work for the past year were presented at the meeting. More than twenty-five men were in constant attendance at the institute, these men representing the principal producers of concrete materials in the state.

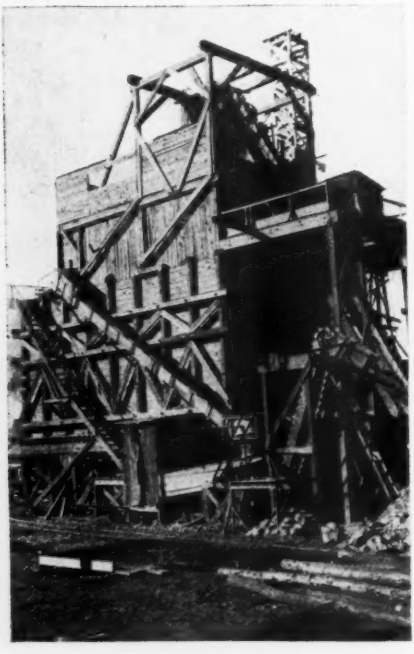
Orders necessitating the operations of the rock crushing plant of the Natomas Company, Oroville, Cal., on full time have been placed by the Western Pacific. The company has issued orders to ballast the entire track of the railroad from Berry Creek to Oakland with crushed rock. Orders for the material have been placed with the local plant of the Natomas company. Forty cars of crushed rock are to be used daily by the railroad. The work will begin at Sacramento, and will proceed north and south from that point. Practically all of the spring and summer months will be occupied in this betterment.

White Cliffs Lime Company, White Cliffs, Ark., has incorporated with $100,000 capital, to crush limestone for fertilizer.

Sand Plant for Big Job.

The Wisconsin-Minnesota Light & Power Company are having constructed on the Chippewa River, in the vicinity of Chippewa Falls, Wis., a dam and power house, which, when completed, will be one of the largest in that part of the country, its ultimate development to be 45,000 horsepower.

The dam and spillway sections are of the hollow type, constructed of reinforced concrete, and require about 60,000 cubic yards of concrete. The core wall in the embankment with appurtenant structures required about 12,000 cubic yards additional. This amount of concrete called for the production of approximately 65,000 cubic



yards of gravel and 33,000 cubic yards of screened sand. The contract for furnishing the major portion of this material was carried out by A. Guthrie & Co., Inc., of St. Paul, Minn., who also were the contractors for the entire foundation excavation, both rock and earth; the placing of approximately 600,000 cubic yards of earth in the embankment, and the construction of the reinforced concrete core wall.

The screening and crushing plant shown in the illustration has produced over 50,000 cubic yards of gravel. The material was brought to the plant by means of 36-inch guage steam dinkeys, pulling six to eight 4-yard cars to a trip, the cars being loaded at the pit with a Marion Model 61 steam shovel. The average length of haul from shovel to plant was approximately three-fifths of a mile.

Two complete screen frames were installed, each one being equipped with two screens. For the greater part of the work, only two sizes of scren 2-inch and ⅝-inch, were used. The screen frames and screens were furnished by the Excavating & Screening Machinery Company of Minneapolis, Minn. The crusher and elevating equipment were supplied by the Allis-Chalmers Company. The motive power for the entire plant was obtained from electric motors. Storage bins, with a capacity of 300 cubic yards, were provided for both sand and gravel.

The pit from which the material came ran low in percentage of gravel, the average for the season's run being but 26 per cent. This necessitated the handling of an immense yardage of raw material to produce the required gravel. Running two shifts per day, the plant produced 12,000 to 15,000 cubic yards of gravel per month.

Articles of association have been filed by the Wolverine Sand and Gravel company of Detroit, Mich., who expect to engage in operating a sand and gravel pit at Clarkston, and in selling gravel and builders' supplies. The capitalization is placed at $30,000, with $11,500 paid in cash. The stockholders are Philip J. Loranger, Edward Burrell, Robert F. Galen, Charles Schweiger, James Peters, Charles Marker, Edward D. Devine, George A. Burns, Frank Burrell, Chris J. Sanner, and Harry J. Dingeman.

PRODUCTION COST OF WASHED SAND AND GRAVEL.

Some interesting figures on the cost of producing sand and gravel were given by Mr. B. E. Neal, secretary-treasurer of the Indiana Sand and Gravel Producers' Association and vice-president of the Neal Gravel Company, Indianapolis, Ind., in a paper presented before the joint meeting of the Indiana and Illinois Sand and Gravel Producers' Associations and reported by Engineering and Contracting.

In submitting the figures Mr. Neal called attention to the fact that the gravel business was a spasmodic one, and that in a year there was only about 4 months of good business, 4 months of business taking about 50 per cent of the output and 4 months when they had no business at all, with heavy expenses for repairs, replacements and carrying the organization through the winter.

A summary of Mr. Neal's figures shows the following:

	Per ton Cts.
Plant cost operating	12½
Plant cost stripping	2
Plant cost repairs and replacements	6
Office and selling expense	5
Taxes and insurance	½
Plant depreciation	3
Depletion of gravel deposit	1
Interest on investment, 5 per cent	1
Total	31

The item of operating cost includes the cost of loading and washing gravel, the cost of power and labor to transport the gravel from the bank to the plant, and the cost of the monthly men while not actually engaged in repairs; also the cost of fuel or electric power, as the case may be. Mr. Neal stated that the experience of his company showed the cost of producing salable material, not considering the material wasted in its production, to be not far from 12½ ct. per ton.

The "cost of stripping" item varies more or less with local conditions. To move the stripping and get it clear away from the scenes of operation, Mr. Neal believes, would cost on an average 30 ct. per cubic yard of stripping moved. This in the case of the bank mentioned above would make the average stripping cost 2 ct. per ton of gravel. Regarding the item of repairs and replacements Mr. Neal calls attention to the fact that producing gravel is heavy and hard work and is the hardest usage that machinery of all kinds can be put to. He believes the average repairs for plants, including repair labor, will average 6 ct. per ton on the year's output.

Plant depreciation is figured on the basis of 15 per cent per year. In giving this figure Mr. Neal states that plants of the cable excavator type must be moved every 3 or 4 years, and that plants of the elevator type with shovels and donkey engines have expensive machinery which does not last for many years. Mr. Neal doubts very much if this amount of depreciation would have covered the cost during the past 6 or 8 years, owing to the changes in gravel specifications which have necessitated rebuilding the plants. As a result of figuring over several plants, their costs and their capacities, Mr. Neal believes that it takes an average plant investment of at least 20 ct. a year to produce 1 ton of gravel. In other words, a plant which will produce 100,000 tons of commercial material could not be erected and made ready for business with a plant investment of less than $20,000. On the basis of 15 per cent depreciation this would mean a cost of 3 ct. per ton for gravel produced.

The item "depletion of gravel deposit" is figured on the basis of there being 65,000 tons of gravel per acre.

The Ohio Granite Company, Elyria, Ohio, has incorporated with a capital of $10,000. The incorporators are W. P. Bates, E. L. Smith, R. H. Smith, Johann Petersohn.

A Difference of Opinion.

At Alton, Ill., there seems to be a difference of opinion as to the price of sand, as well as on several other matters. We cannot say what started it all, as we have seen only occasional newspaper extracts which have led us to believe that all was not harmonious along the river.

The situation has apparently become so acute that the Mississippi Sand Company has recently used a large amount of advertising space in the Alton Daily Times to state its case in big type. This it does in a forcible and straightforward way, and some of the points at issue can be gleamed by reading the statement. Here is what it says:

A Statement of Facts to the Public.

This Company deems it proper at this time to make a statement to the public.

In the fall of 1911 this company requested of the city of Alton certain privileges in return for which we promised a perpetual price on all sand that might be needed by the city or schools and to pay an annual rental of $500 per year.

This company requested a lease on a tract of ground fronting 60 feet on the river and the privilege of laying two switch tracks at its own expense. We also agreed to build a vitrified brick roadway leading from State street to the sand bins at our own expense and to maintain same perpetually.

The offer was turned down. We are not referring to this at this time in a spirit of criticism. The tract of land which we wanted to use is to this day vacant and no use of same is being made by the city or anyone else and that the city made a mistake is plainly apparent. We are referring to it now for two reasons. First, it was necessary for us to make other arrangements for building our plant which cost us a large sum in excess of what would have been the cost if the city had granted the lease which we requested, and, second, it can not reasonably be expected that we can afford to sell sand in these days at the prices we offered to sell to the city and schools if our lease had been granted.

Without the encouragement we asked, we went ahead and have constructed at a large expense the most modern and best constructed sand plant along the Mississippi river. That point is conceded even by our competitors along the Mississippi river, many of whom have come here and inspected our plant as a model.

We did not construct this plant for the purpose of supplying Alton only. Our plant is of such great capacity that its operation one-half day out of each week on an average the year around could easily supply the entire local demand. No business concern could afford to construct and operate such a plant as ours relying upon the local demand only. Our plant is adequate not only to supply the entire demand of Alton, but to supply twelve times that demand from outside orders. Another way of stating this so as to drive the point home, is that we pay out in Alton five dollars for every dollar's worth of business we receive from Alton.

Moreover, the sand business constitutes only 20 per cent, or one-fifth of our business. We have purchased quarries, we have added machinery, we have incurred the expense of a wholesale department for building materials, we have purchased trucks for delivery and we have, in short, invested an almost staggering sum of money to give Alton a modern plant with a delivery service which is worthy any large city along the river. In our line we have made Alton first.

We have devoted considerable expense and effort in encouraging farmers hereabouts to use limestone as a fertilizer and have developed that feature into an important part of our business. This is to the great advantage of Alton.

Our service consists in the fact that sand, gravel, limestone, lime, cement, ground and milled stone, limestone fertilizer, in fact, anything in our line can be ordered at any season of the year, and we can and do make delivery oftentimes within one hour. When heavy supplies of sand and so forth have been needed we have run our delivery trucks at night and on Sunday and have supplied the demand promptly. This could not have been accomplished but for our modern and expensive plant.

The difference between the facilities afforded the city of Alton by this company and the old time way of securing sand by loading into a wagon with a shovel is one of the things that makes Alton different from Fosterburg, for example. Alton is a city and Fosterburg is a country village.

Suppose a large job of paving was under way in Alton and this company had no plant here. Suppose the river was at such a high stage that no sand could be secured by shoveling from the river bed into the wagons. What would Alton do?

It would either be obliged to secure sand from some other city with a plant like ours or else hold the public improvement in abeyance until the river went down. Suppose sand should be needed for some important building at some time when the river were frozen over. The building would have to wait until spring.

The intrinsic value of sand is hardly more than that of water. Our charge is for service. The greatest river in the country flows by our very doors and water is free. But the inhabitants of Alton do not go down to the river with buckets for their supply. They could do that without being out one cent. They prefer the modern way of having a water system. The water is pumped into the water plant and there filtered and chemically treated and then under sufficient pressure to reach all parts of the city it is pumped into the homes so that the mere turning of the faucet results in all that is needed of pure, clear water, and it is not for the water that we of Alton pay but for the service.

This illustration is parallel to the service rendered by this company in the matter of supplying sand. This company pumps and washes the sand and its product is free from mud and is in every way as much of an improvement over sand shoveled from the river bank as is the water from your faucet an improvement over water that might be dipped from the river. Then, our price includes delivery. Delivery is one of the chief items of our expense. We have invested a large sum in automobile trucks which makes possible the prompt and reliable delivery that we practice.

This company has not received any subsidy from Alton. It mentions the matter not in the way of complaint but as a fact that it has received no encouragement from the city. It has been built up largely as a matter of pride, it being the ambition of the owners to provide Alton with the best plant of the kind along the river. It is owned and managed by Alton men. It is a home institution. It desires to have Alton grow. Besides its pride in the growth of Alton it admits of course that the growth of Alton will prove profitable to this company as it will to nearly all business institutions.

The prices which this company asks for its products are reasonable and are cheaper than prevails in other cities. Sand, stone and cement can be purchased in Alton cheaper than in any city along the river.

There is no more need for another sand company at Alton than there is for another water company. No more need for another sand company than there was for the Piasa Light and Power Co. This company deals fairly and it asks to be dealt with fairly in return. It feels certain that the public stands ever ready to give a fair and square deal to all deserving institutions and it hopes that the above statement of facts will be considered.

At a recent meeting of the council streets committee of Detroit, Mich., bids for sand, bank gravel, and river sand and river gravel were rejected because the prices were twice as high as in 1916. Readvertising for bids was ordered.

A new company known as the LeRoy Lime and Crushed Stone Company has organized in LeRoy, N. Y. Offices of the company will be located in the O'Shea block of that city, while the plant will be a mile and a half east of it, where was formerly located the Keeney quarry. The plant will be ready for operation about the first of May. The directors of the company named for the first year are John Heimlech, Mrs. Margaret Heimlech, and J. Leonard Heimlech. George Gruhl of Dundas, Canada, who was superintendent of the large plant of the Canadian Stone Corporation, has been engaged as superintendent and salesmanager.

E. G. Shute, who has conducted a sand and gravel digging and loading business at Hazelton, Indiana, for nine years, recently sold out to the Dozier, Dunkle and Lane Company of Mount Carmel, Ill. The new company intends to add about $20,000 worth of machinery and increase the output to a considerable extent. Mr. Shute added considerable equipment while he owned the plant and had it fixed so that he could take the sand and gravel directly from the bottom of White River and load it on the cars, but the demand has always been greater than the supply from this plant and the company intends to equip it so that it can handle the business.

A large gravel pit near the village of Wilton, Minn., is to be opened next spring for commercial purposes by Mr. Ruggles, a Manistee, Michigan, millionaire lumberman, who owns much property in the northern part of Minnesota. As a result of the opening up of this gravel pit a large concrete manufacturing plant is also expected to be established there. A short line of railroad is to be built by J. J. Opsahl of the Red Lake Northern Railway & Construction Co., and M. A. Ronglien, manager of the Wilton Lumber Company, running from the Soo line tracks at Scribner, Minn., to the sawmill of the Wilton Lumber Company and the Ruggles gravel pit site.

Work on opening up its new quarry enterprise just west of Kankakee, Illinois, has been started by the Lehigh Stone Company. The preliminary work is just the beginning of an expenditure of over $150,000 in the building of one of the most complete crushing plants in the state. The new quarry adjoins the present quarry at Lehigh. Some time ago this company purchased 160 acres of land adjoining its present quarry. After a survey of the land it was found, to the great surprise of all concerned, that every acre of the tract was underlayed with stone which ran to an unlimited depth. The finding was so satisfactory that M. J. Edgeworth, the owner of the company, at once decided to put in a crushing plant that would be one of the biggest in the state. A force of men has been put to work stripping a part of the new field, and building a new track which will connect with the Illinois Central railroad.

Where Will Our Sand Come From?

Chicago sand companies, which have been taking sand from the Indiana shores of Lake Michigan, sent attorneys to Indiana recently to fight an injunction prohibiting further removal of the material.

For eight years, it is said, the Chicago companies took sand from Indiana at the rate of 500,000 cubic yards a year. A strong protest was made against the practice and the injunction was issued. The attorney general of Indiana charged that the sand properly belonged to the state, and that the removal was nothing short of robbery.

Indiana is not alone in its complaint against the Chicago sand companies. The same companies have taken millions of cubic yards of sand from the Illinois shores. For years they operated their "sand suckers" off the shores of Waukegan until forced to go elsewhere. They operated off Zion City for the last two or three years until the officials of the city filed suit to oust them. Some of the companies are from Chicago; others are from Milwaukee.

It is claimed that the removal of the sand from a point near shore endangers the lives of bathers because it leaves unsuspected holes in the beach.

Reputation Is Valuable.

It is a serious matter to accuse a sand and gravel contractor of giving short measure, and no such accusation should be brought unless there is a reasonable probability of being able to substantiate it.

The fact has recently come to our attention that the city of Bangor, Me., has brought suit for $15,000 against a sand and gravel contractor, claiming a shortage of several thousands yards in gravel delivered to the city.

So far as the evidence is reported in a daily press, however, there seems to be a lamentable lack of direct testimony one way or the other. In fact there seems to be more guesswork and hearsay in the evidence than is usually allowed in a court of justice.

If such claims are made, they should only be made where the city, or other purchaser, feels sure of his ground; and the defendant in such a case, if he feels that he delivered honest measure, should go to the uttermost to defend his reputation.

Larger San Francisco Office for Williams Company.

The Williams Patent Crusher & Pulverizer Company, of St. Louis, Mo., has taken larger quarters for its Pacific coast sales office at 67 Second St., San Francisco.

The San Francisco office, which has been in charge of Mr. O. J. Williams for a number of years, has developed a very satisfactory trade in the many fields in which the Williams mill is used.

The new quarries are larger and more centrally located and are connected with a warehouse in which the Williams company maintains a complete stock of spare parts for different types of their grinders. This makes it possible to supply parts promptly to customers who are far removed from the main office.

The increased business of the Williams company is not directly traceable to war contracts. However, the manufacturing of many materials in this country which were formerly imported from the nations now at war, has opened up new fields for the Williams mill.

Articles of incorporation have been filed with the county recorder, Mt. Pleasant, Iowa, under the name of the Mt. Pleasant Crushed Stone Company, which is capitalized at $60,000. Ralph M. Burtis of Chicago is president; E. K. Stahl, Mt. Pleasant, vice-president; F. H. Cling, Chicago, treasurer, and E. Metcalf, Chicago, secretary.

We Are the Pioneer Manufacturers of Gravel Washing Machinery

The first gravel washing plant was an "S-A" Plant. We developed the original gravel washing machinery which is still recognized as standard. In fact, the records will show that we actually developed the industry.

Altogether in the past fourteen years we have designed and equipped about 400 gravel washing plants. Each one of these was especially designed—each one has been a *commercial success*. We have turned down orders for a number of plants where the elements of success where lacking. We have turned failure into success for several others by re-equipping with "S-A" Machinery.

We have a strong organization of engineers—and a large plant devoted to the manufacture of the highest grade of conveying elevating, screening and transmission machinery.

It is to your interest to deal with manufacturers and not jobbers

"Ask the Man Who Owns One"

The following is an incomplete list of the newer "S-A" plants

Gravel Washing

Los Angeles Rock & Gravel Co.
Scottsville Sand & Gravel Co.
Montana Concrete Co.
Vandalia Railroad.
Standard Builders' Supply Co.
Hawarden Sand & Gravel Co.
H. D. Conkey Sand & Gravel Co.
F. A. Downs Construction Co.
Mason City Sand & Gravel Co.
Jensen & Jensen.
Virginia Sand & Gravel Co.
L. D. Burd.
Wabee Gravel Co.
Summit Sand & Gravel Co.
Geo. J. Hoffman.
Logansport Gravel Co.
Battjes Fuel & Supply Co.
Wabash Sand & Gravel Co.
Macksville Gravel Co.
Mason City Sand & Gravel Co.
Covington Sand & Gravel Co.
American Agricultural Chemical Co
Madison Construction Co.
Windsor Sand & Gravel Co.
Atwood Davis Sand Co.
Lake County Gravel Co.
Chas. Vivian.
Vigo Washed Sand & Gravel Co.
Interstate Material Co.
H. W. Hawly.
Wabash Sand & Gravel Co.
Kingsley & Pagant.
Pueblo Bridge.
Minden Gravel Co.
C. H. Billings.
Canada Sand & Gravel Co.
C. H. Little & Co.
Beaver Sand Co.
McCraney Sand Co.
Coon River Sand Co.
Downs Construction Co.
Virginia Sand & Gravel Co.
Chicago Gravel Co.
Hoyt Mining Co.

Stone Washing

Brownell Improvement Co.
Peoples Crushed Stone Co.
U. S. Crushed Stone Co.
Big Rock Stone & Const. Co.

"S-A" Equipped Crushing Plants

A. C. Laughlin Stone Co.
France Stone Co.
General Crushed Stone Co.
National Lime & Stone Co.
Bessemer Limestone Co.
Branchton Limestone Co.
Blair Limestone Co.
Standard Lime & Stone Co.
Union Lime Co.
Elmhurst & Chicago Stone Co.
Leathem & Smith.
Greenleaf Stone Co.

We'll gladly supply the address of any of the above for reference or send names of "S-A" plants in your territory

Put your proposition up to us and we'll help you make it pay

Stephens-Adamson Mfg. Co.

Aurora, Ill.

Appointed to Chicago Office

The Traylor Engineering and Manufacturing Company of Allentown, Pa., announces the appointment of Mr. L. J. Hewes to have charge of the Chicago office of the company at 1414 Fisher building.

Mr. Hewes has been familiar with the sale of stone crushing and lime equipment for thirty-six years, having been with Power and Mining Machinery Company and other manufacturers.

This company is well known to the trade through its line of jaw and gyratory crushers, screens, and other equipment for reducing and handling heavy materials.

Gravel Pit Sells Many Duplex Trucks

"That gravel pit over there is one of the most important cogs in our sales organization," declared H. M. Lee, president of the Duplex Truck Company of Lansing, Mich., to a western state dealer who was being shown through the motor truck plant recently.

"Yes sir, I mean every word—that gravel pit sells Duplex trucks and it sells a lot of them. It offers more convincing arguments than any silver tongued salesman I ever met. I wouldn't part with that gravel pit for a lot of money."

Then Mr. Lee gave a demonstration of Duplex truck pulling power at the gravel pit.

A Duplex truck was loaded with a 3½-ton burden and a trailer carrying 4 tons was attached. The truck was taken down into the pit where there was a pool of water nearly a foot deep surrounded by soft earth into which the truck wheels sank nearly to their hubs. At one time all of the wheels but the right front one were in such soft earth that none could find traction. However, the entire power was automatically thrown by the Duplex-Adler locking differential to the front wheel which had a "footing" and the 7½-ton load on the truck and trailer was hauled not only out of the pit but up a steep embankment.

After the truck had maneuvered in and about the gravel pit for a half hour and the strenuous tests were completed the dealer asserted to Mr. Lee that he was thoroughly convinced of the selling ability of the gravel pit.

"If I could only get a thousand prospective motor truck buyers gathered about the gravel pit, I would wager that the gravel pit would sell 999 of them Duplex trucks," declared Mr. Lee.

Enlarged Facilities

When, a short time ago, fire broke out in the plant of the Gruendler Patent Crusher & Pulverizer Company, St. Louis, the firm was so overstocked with orders that they found it necessary to get back onto a working basis immediately.

The result is that the company is now established in new quarters, larger and better equipped with the most modern type of machinery, placing them in a position to make prompt delivery of grinding machinery of every description.

Owing to the heavy business and great demands made on them by their trade, this firm have been contemplating in the past few months enlarging their plant; but due to the rush of business they were compelled to run double time in their old plant rather than close down while necessary improvements were being made.

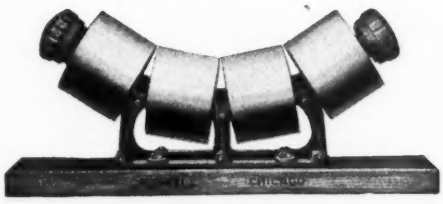
They now have under course of construction a warehouse and modern office on the site of their old building, adjoining their present manufacturing plant.

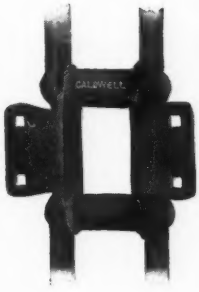
A new company, known as the Kalamazoo Gravel and Sand Company, of South Bend, Indiana, has incorporated for $75,000. Edward Jeffrey, J. R. Preston and D. C. Rogers are directors.

CALDWELL MACHINERY

FOR HANDLING

Stone, Gravel, Sand





Screw and Belt Conveyors, Steel Elevator Casings and Buckets, Gears, Cut and Cast Teeth, Link Chain Belting, Shafting, Pulleys, Sprocket Wheels, Etc.

H. W. CALDWELL & SON CO.

CHICAGO

Western Ave., 17th to 18th Sts.

World's Largest Crusher.

The Kennedy-Van Saun Manufacturing and Engineering Corporation, 120 Broadway, New York, recently completed the installation of a No. 60 gyratory crusher at the Michigan Limestone & Chemical Company's plant. This is claimed to be the largest crusher in the world.

This company is operating a property in northern Michigan on the shores of Lake Huron at Calcite, which is within a few miles of Rogers City. It comprises approximately 12,000 acres of limestone land. The quarry face at the present time is about 1½ miles in length and has an average face height of about 50 feet. A large number of churn drills are used for drilling the full height of the face, which is shot off in successive layers with dynamite.

Six 110-ton steam shovels with 3½ yard dippers are used in shoveling the blasted material into trains of eight to ten cars of 10 yards' capacity each. These are hauled by steam locomotives on standard gauge tracks. The trains are controlled by a tower man with an electric signal system so that the engine man of each train is shown which shovel he is to serve on each trip, and the delivery of the stone laden trains is therefore systematically controlled for feeding the primary crusher.

As the tracks approach the crusher house they are arranged so that the stone can be delivered on either side of the crushers. Up to the present time, all of the stone has been delivered to a No. 42 Kennedy Gyratory crusher, which has been in service about five years, and it has produced an average of about 16,000 tons of crushed limestone per 20-hour day. The recrushing operation to produce the finer sizes of stone required is accomplished with No. 7½ Kennedy gyratory crushers.

Recently this company has installed an additional primary crusher in order to secure a larger tonnage capacity, and also to receive larger stone so that the cost of quarry blasting would be minimized, and there will be less opportunity for any delay from pieces not entering the crusher on account of the receiving opening being of insufficient size.

This No. 60 crusher has a capacity of approximately 25,000 tons per 20-hour day, crushing limestone from a maximum size, which will enter its receiving openings, having a combined area of 60½ inches by about 35 feet, down to about 8 inches and finer.

The crushing space between the head and concaves holds 30 tons of stone, and this, together with the hopper which flares out above the head and concaves with an outside diameter of about 22 feet, affords receiving capacity of over 65 tons of stone.

The design of this unusual machine naturally required much careful study, not only as regards its operating features but also its manufacture and transportation. For instance, its spider, which is made in a single casting, came within 1 inch of the height limit permitted by railroad regulations, even when shipped in a well bottom car.

The top shell, on account of its great weight, could not be shipped in one piece, and was therefore constructed in two horizontal sections connected by heavily flanged male and female tapered machined joints securely bolted so that its strength is increased instead of reduced by this procedure.

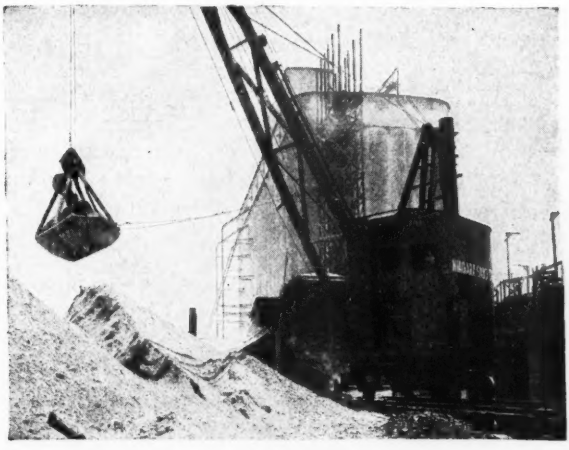
The main shaft is about 3 feet in diameter at its largest portion and about 28 feet long. The total height of the machine is 34 feet. It is driven with 1¼-inch Manila ropes by a 66-

Blaw Buckets

SIMPLE DURABLE

Built to Dig and last while Digging

Write for the Blaw Bucket Book



Blaw Type C Bucket being used by Niagara Sand Company

Blaw Buckets Insure Economy

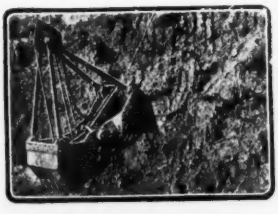
For every bucket job—digging, dredging, material rehandling, etc.—there is a Blaw Bucket to fill the needs of that job and do the work with speed and economy.

Blaw Buckets can be furnished for handling coal and ore, for dredging, excavating, sewer digging, loose rock or sand handling, for foundation and embankment work, for the handling of all bulk materials.

Tell us your bucket problem. Let our Engineering Department specify the exact Blaw Bucket to handle that job quickly and cheaply. ***Buckets in stock for immediate shipment.***

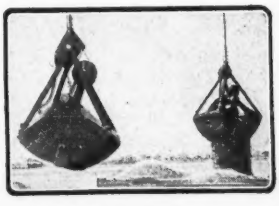
Blaw Steel Construction Co.

Suite 605 Farmers Bank Bldg. PITTSBURGH, PA.



Blaw Digging Bucket

The handsome new Blaw Bucket Book—just off the press. Write for your copy.



Brim Full and Dumping

inch cast steel sheave, having 18 machined rope grooves. It is operated by the English system, so that if as many as half of the ropes should fail from wear, the crusher can still serve, continuity of operation being of greatest importance.

The source of power is a 300 horsepower motor, which has been found ample for the requirements.

In the design of the various parts of this machine, the calculations were based on known factors, derived from experience with a large number of similar crushers from the smallest size up to the largest heretofore built. While the detailed processes of these calculations would manifestly involve too much space for a description of this kind, it is interesting to note that the parts of this No. 60 crusher have to withstand stresses produced by a pressure of more than two million pounds at the crushing surfaces.

The hydraulically forged steel main shaft is designed on the basis of a maximum fibre stress of 10,000 pounds per square inch, semi-steel casting of 3500 pounds per square inch and steel casting 8000 pounds per square inch.

The eccentric is of the patented spherical ball and socket type, so that this most important bearing is self-aligning. This largely explains the low power consumption. This steel eccentric bearing is lined with a phosphor bronze bushing constructed in halves, thus forming the most perfect bearing construction known, and which removes the annoyance of re-babbitting.

The spider is set clear of the concaves so that the latter can be reset without disturbing the head or spider, a most valuable convenience to the operator. These concaves are made sectionally and in four horizontal belts to facilitate handling the sections, and so that when worn only those portions requiring replacement need be renewed. The head is rigidly secured to the main shaft on its smooth tapered portion, and is of the Kennedy patented self-locking type, which automatically is kept tight on the shaft, and thus additionally serves to reinforce the shaft at the place where the greatest stress is applied. This is held in position by a nut sleeve fixed to the shaft but without threads on the shaft: this nut operates in a follower zinced in the top of the head. It will be seen that the tendency of the head to rotate on the shaft forces the head down tightly on the tapered portion of the shaft so that it is automatically locked in position at all times. The head and concaves which take the principal wear from crushing are constructed of semi-steel castings of special mixture deeply chilled on their working surfaces to give wear resisting qualities.

The Steinman Development Company of Camden, N. J., has been chartered to mine, quarry and deal in coal, ore, rock, clay, sand and minerals. This company has a capital of $150,000 and the incorporators are Duncan C. Anderson, Harry M. Kurtz, William H. Triol, Philadelphia.

The Sussex Limestone Products Corporation, of Franklin, Sussex Co., N. J., has a capital of $200,000. This company handles limestone, ores, stone, oils, etc. The incorporators of the company are Charles G. Wingate, Robert Kuzmier, Thomas G. Durkon, New York.

The work of improvement has been started on the Dick Sand Company's plant which is located near Polk, Pa. This work will cost more than $60,000. A large amount of new equipment has been installed in the plant, among them being a new model 36 Marion steam shovel. Most of this new equipment has been purchased by J. C. Dick and Chess Lamberton, large stockholders and directors. The plant is turning out about 300 tons of sand every day, but with the new equipment and other improvements, the company is figuring on a capacity of 1,000 tons in the near future.

For Sale

SAND and GRAVEL PLANT, located on Mississippi River, inexhaustible supply of first class material. No boats or barges required, pumps direct into screens. Will sell at a bargain as owner has other business requiring his attention. Address C. S. C., Care of Pit & Quarry, 529 S. La Salle St, Chicago, Ill.

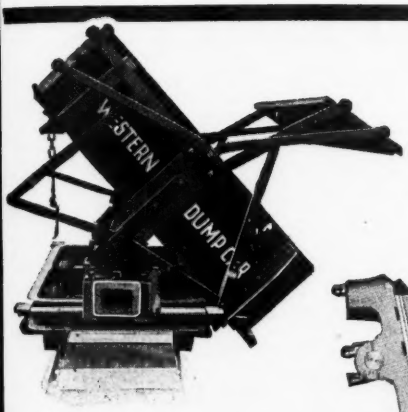
Gravel Ground for Sale

20 acres of sharp gray gravel, situated on the Big Four R. R. and Honey Bee Traction Line, 16 miles from Indianapolis, and 18 miles from New Castle, Indiana.

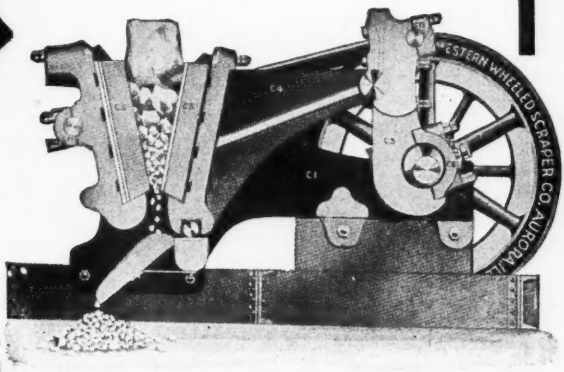
Address:

W. J. Halsall, Greenfield, Ind.

Make Your Pit or Quarry Pay



THE Aurora Portable Steel Crusher gives maximum amount of product for power used. Its enormous strength makes it a favorite.



Western Dump Cars are justly famous for their quick, clean dumping and rugged permanent efficiency.

WESTERN WHEELED SCRAPER COMPANY
AURORA - ILLINOIS

The Obenberger Bucket

1/3-3 cubic yards Capacities

The Obenberger Bucket for Sand, Gravel and Crushed Stone Handling, is very sturdily constructed with a view to long, unfaltering service. The cutting edges run from the top of the shell on one side to the top on the other side. Teeth are furnished when desired. The closing drum has bronzed bushing at each end and the sleeves are hollowed out as oil reservoir.

We manufacture all styles of Buckets, Scrapers, Hoisting Carriages and Blocks, Industrial Cars and Contractors' Equipment.

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Jos. Obenberger & Son Co.

121-127 Barclay Street
MILWAUKEE, WIS.

THE BUDA
GRAVEL WASHER
Requires No Power

It Is Thorough

The Buda Gravel Washer is simply a flume with a perforated metal bottom, set at a slant of 1 inch fall per foot. The gravel is let in at the high end and washed down through the flume with water. The perforations are set in depressions. The sand catches in these depressions and falls through the perforations; these perforations may be had in different sizes as desired. In rolling through the flume and passing through the water, the gravel is perfectly scoured and washed.

It Is Economical

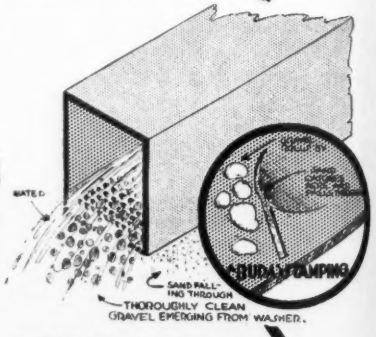
The initial outlay for the Buda Gravel Washer is much less than for the ordinary washer. The fact that gravity furnishes the power is a great economy in operation. With a 1/16 inch perforation and a water supply of 400 gallons per minute, the Buda will wash 15 to 20 tons of gravel an hour.

It Is Portable

The Buda's standard length is 32 feet, but is made as small as 16 feet long. It is very easy to move from one position to another. It is just the thing for contractors wishing to save the difference in price between washed and unwashed gravel.

It Is Durable

The Buda is all steel. It has no moving parts to wear out and cause trouble. In short, it is the greatest little gravel washer ever produced.



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Everything for Sand and Gravel Plants and Contractors

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Elevators and Conveyors

For Sand, Gravel, Stone, Etc.

YOU can entrust your requirements for sand, stone and gravel handling plants to our experienced engineers and be assured of a practical, efficient plant. Whether you plan a complete new plant, or require additional equipment, we shall give your conditions our best study.

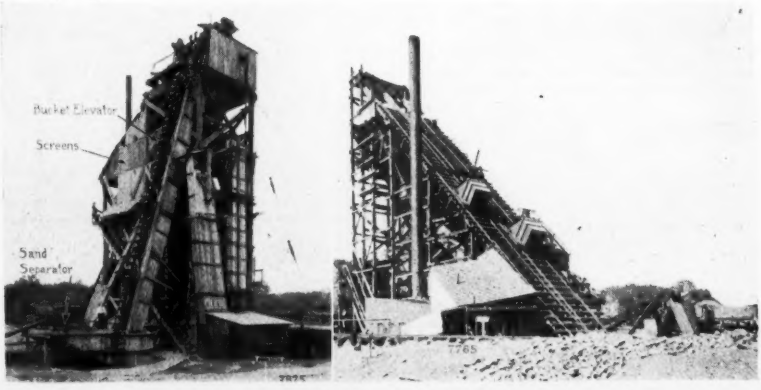
Communicate with us at once if you are contemplating the installation of new machinery or making alterations in your present plant this Spring. Owing to the unusual condition of business in the machinery field, shipments will be facilitated if orders are placed early. Act today.

Link-Belt Equipment includes:

Gravel Plants *Stone Plants* *Sand Plants* *Bucket Elevators and Conveyors*
Washeries *Screens* *Locomotive Cranes* *Grab Buckets*
Car Unloaders *Wagon Loaders* *Link-Belt and Sprocket Wheels, etc.*

Let us figure on your requirements. Our experienced engineers are at your service. Write for Book No. 213.

LINK-BELT COMPANY, Nicetown, Philadelphia, Pa.



P-7

Relaying Rails
Derricks
Structural Steel
Plates, Beams, Etc.

For Immediate Shipment.

R. W. BAILY
122 South Michigan Boulevard
Chicago

Dragline, Shovel, Etc.

FOR SALE

1—Dragline, electric, Bucyrus 175B, 125 ft. boom.
1—Model 76 Marion Steam Shovel, Shop No. 2777.
1—10" Morris Direct Connected Steam Water Pump, used a few weeks.
2—Sullivan 3⅝" Tripod Air Drills and steel and 4 pcs. new hose 1¼"x50'.
3—Sullivan Channelers, duplex, latest and steel.
1—Air Receiver, 26"x6'.
2—6x4-6 Worthington & Deane Duplex Steam Pumps, one 5¼x3½x5 Deane, one 10x6x10 Deane.
1—Compound Duplex Deane, 8x12x7x10.

JAMES O. HEYWORTH
HARVESTER BLDG. CHICAGO, ILL.

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1 Lidgerwood Portable Derrick, 40-ft. boon.
13x21 Blake Jaw Crusher.
No. 6 Austin Crusher.
1-40 R. Bucyrus Shovel.
1-65 Ton Bucyrus Shovel.
80-4 yd. Western Cars.
3 Baldwin 10x16 Dinkeys, 36 in. Gauge.
1-14x24 Porter Standard Gauge Dinkey.
2-11x26 Champion Jaw Crushers.
2 Draglines.

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For dependable "used" equipment and machinery within the following lines:

Steam Shovels
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Two cu. yd. Page drag line bucket.
One and one-half cu. yd. Page drag line bucket.
Two Lidgerwood cableway engines.
One 31 cu. ft. Smith concrete mixer, motor driven, complete with hoppers, tower bucket, etc.
One single drum Thomas electric hoist with 40 HP. Wagner motor.
One Ingersoll-Rand monitor H-8 track channeller, complete with boiler and track.
One Sullivan class VW-61, duplex, track channeller, complete with boiler and track.
Five Sullivan FP-3 HySpeed rock drills, 3⅝" cylinders, hollow piston.
One Oliver spreader, standard gauge.
One Monarch pile hammer.
Three Morris 12 inch, low lift, centrifugal pumps.
One six-inch Buffalo centrifugal pump.
Five three-inch Nye pumps.
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One six-inch Nye pump.
Model 61 Marion steam shovel, factory No. 3114, standard gauge, 2½ cu. yd. dipper.

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HENRY BICKEL CO.
LOUISVILLE, KY.

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Colorado Building Washington, D. C.
CONSULTING ENGINEER

Difficult sand and gravel washing problems a specialty. Complete plans suited to each particular case. No connection with any equipment concern or builder.

Operating as Well as Designing Experience

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3 Star and 3 Keystone
Drilling Machines
Suitable for blast hole work.
Ready to ship.
Box 1241 Providence, R. I.

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All makes, types and sizes, steam and power driven and for various pressures, guaranteed condition. Some are factory repaired. **Twenty years' experience with compressed air apparatus at your command.** Send me your inquiries.
George S. Githens, 6 Beacon Street, Boston, Mass.

Long Life and Efficient Service are Characteristics of the

WILLIAMS BUCKETS

because they are built of steel on designs which embody the right mechanical principle.

Simple in construction; bearings, few and extra large; all sheaves bronze bushed; cables perfectly guarded; alignment of sheaves exact at all times; scoops heavily reinforced and so constructed that there is absolutely no side movement; powerful and speedy closing arrangements.

—These are a few of the features that help to make our repair part business so small.

THE DIAMOND SAND & GRAVEL CO.
BEDFORD, OHIO

SAND— CONCRETE, SIDE WALKS, PLASTERING, PAVEMENTS

GRAVEL— CONCRETE, SIDE WALKS, BALLAST, ROOFING

September 26th, 1916

Mr. Louis McLouth,
Chicago, Ill.

Dear Sir:-

Referring to your inquiry as to our success with the Williams Clam-Shell Bucket, wish to say that we have used five different makes of buckets, but none of them, except the Williams, lasted a season.

Some of them would dig as good as the Williams, but they would not stand up, as at times we pick up rocks or chunks of gravel that weigh from 1 to 10 tons, which either broke a hinge or bent the shell.

We also dig gravel out of the water, and the bucket doing this work is 3 years old and lifting this material 50 feet out of the water it does not lose a pound.

The above will show you what we think of the Williams Bucket, and we will continue to use them until we know of something better.

Yours very truly,

The Diamond Sand & Gravel Co.

Fred J. Schmidt

Built in types and sizes for every purpose.
Catalog by return mail on request.

THE G. H. WILLIAMS CO.

General Office and Works, ERIE, PA.

54 holes, average depth 92 ft., fired by means of Cordeau-Bickford Detonating Fuse

CORDEAU-BICKFORD

An Instantaneous Detonating Fuse for

SAFETY and EFFICIENCY

Particularly adapted to well drill shooting where large columns of explosives are fired, where it is desirable to break the charge in the drill hole, or where a great many holes are to be fired at one time.

Cordeau is run from the top to the bottom of the drill hole in contact with the explosive charge—one continuous detonator.

RESULTS: Complete detonation, quicker detonation, greater shattering effect, lower secondary costs, substitutes a detonator which is insensitive to shock and friction in place of the electric caps.

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THE ENSIGN-BICKFORD COMPANY

Original Manufacturers of Safety Fuse

Established 1836

SIMSBURY, CONNECTICUT

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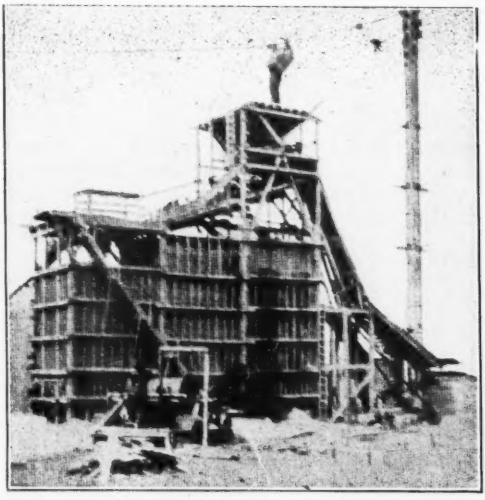
"DULL" PLANT

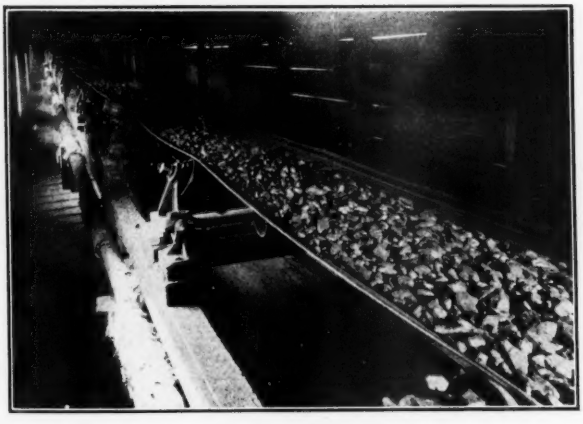


The Bucket is especially designed for use in sand and gravel plants, It's one of the famous DULL Rear Dumping Type. Every trip brings a capacity load. That's one detail.

The Screens are the celebrated DULL Inclined Conical Type. These screens produce, at the lowest figure possible, the highest quality, best-profit returning, sand and gravel.

The General Equipment and Layout of the plant illustrates Raymond W. Dull's **mastery of detail,** a quality that has made this plant and other DULL plants highly successful.

THE RAYMOND W. DULL CO., 111 W. Washington St., CHICAGO



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White Seal Belt

Ampere Canvas Belt

Write for Recommendations, Samples and Prices

Victor-Balata & Textile Belting Co.

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172 N. Franklin St.

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EASTON, PA.

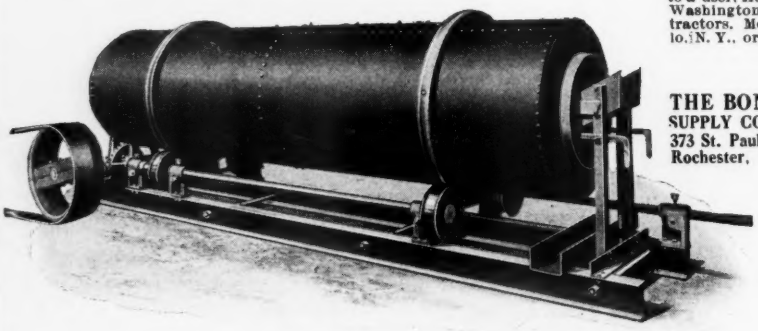
BROOKLYN, N. Y.
465 Kent Ave.

The Rapid Sand and Gravel Washer

You can convert dirty sand and gravel unto the very finest quality and material for concrete in record time and at rock bottom cost, with a RAPID Sand and Gravel Washer. A *scouring* motion is the answer. The final step in the operation is a thorough rinsing in fresh clean water.

Despite its thoroughness, the process is very rapid. These properties are *permanent* in this machine; it is very sturdily constructed, cylinder of heavy steel, riveted. It is made in four capacities.

If you care to know what the RAPID can really do, write to a user, Hembt & Washington, Contractors, Monticello, N. Y., or to us.



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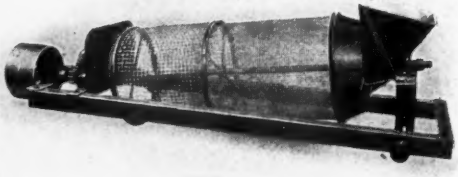

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If you have material to screen, it will pay you to learn more about S. & S. Screens, write, giving us an idea of your requirements and we will do the rest.

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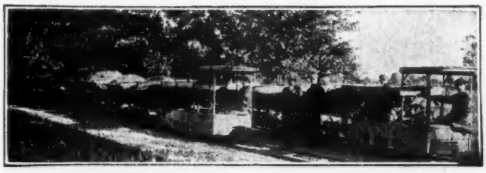
MADE BY THE
J. D. FATE CO



"We Haul Our Gravel 2½ Miles at 5c a Yard"—

Says Mr. Sullivan

Phelan & Sullivan, contractors of Syracuse, N. Y., built the Syracuse-Bridgeport state highway. There was a haul of gravel from pits to point of use 2½ miles—and Phelan & Sullivan hauled their gravel at a cost of 5c per cubic yard, which was twice as cheap as steam or horses ever did.

Friction-Driven **The Plymouth** **Continental Motor**

Gasoline Locomotive Makes This Possible

1: The Plymouth costs less to **buy** than any other locomotive, as its price is ⅓ to ½ less.

2: It costs less for **labor** operation, as any ordinary day-laborer can run it.

3: It costs less for **fuel**, as the 3-ton size, like P. & S. bought, consumes less than 5 gals. gasoline per 10 hours.

4: It has less **engine** trouble, as the "Continental" motor (the best to be had) is used.

5: It costs less for **lubricants**, as the Friction-Drive requires none and Hyatt Roller Bearings are used.

6: It **hauls** greater loads, because the Friction-Drive gives full motor power at ALL speeds.

7: It takes **higher grades** because the Friction-Drive permits starting off with load under FULL power.

8: It costs less for **repairs**, because it is simpler in construction than ANY other locomotive.

Mr. Sullivan Proves the Above Statements—He Says:

"The two Plymouths make ten trips each day with 9½-yard cars, making a total of 270 cubic yards of gravel per day," writes Mr. L. D. Sullivan. "The cost of operation is $13.50 for labor, gasoline and oil, which is, approximately, 5c per cubic yard."

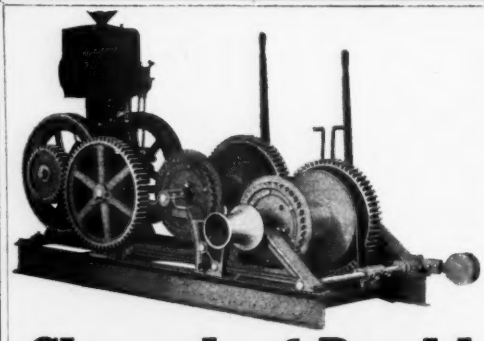
WHY NOT INVESTIGATE?

Hundreds of Plymouths are cutting haulage costs in sand, gravel and clay pits, in stone quarries, road construction work and wherever haulage between two fixed or temporary points is required. YOUR case is no different from **these.**

We have a book that gives the full story of Phelan & Sullivan and 34 other installations with cost data, wave-line charts, pictures, etc. A copy is yours for the asking.

The J. D. Fate Company

206 Riggs Avenue **Plymouth, Ohio**



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in the most economical way is accomplished with the light weight self-contained

Cloverleaf Double Drum Hoist

GASOLINE or ELECTRIC POWER

Outfit operated with 2 men will easily save from 5 to 6 teams and drivers. Saves you moving your heavy excavating machinery, when they ought to be digging products.

Operation Expense at Minimum *Write for Catalogue*

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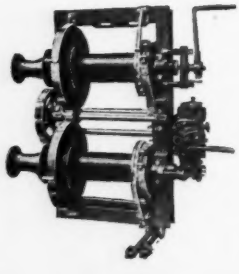
LOCOMOTIVES--CARS--RELAYING RAILS

DAKE ENGINE CO.

HOISTS of All Kinds

STEAM **AIR** **ELECTRICITY**



Nothing like them for Quarry Work.

BEST SWINGING ENGINE MADE

Write for Catalogue showing all machines.

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For the convenience of our readers our "Free Service" department will furnish on request any information, catalogs and prices on any machinery, equipment or supplies used in pits and quarries. The coupon below makes it easy for you. Simply check, sign and mail. There is no charge.

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PIT & QUARRY, 527-529 S. La Salle St., Chicago, Ill.

Research Department,
Pit and Quarry,
527-529 S. LaSalle St., Chicago, Ill.

Please secure for me ☐ catalogues, ☐ prices and ☐ other information, pertaining to those items checked below:

☐ Acetylene Welders.
☐ Belting.
☐ Blast Hole Drills.
☐ Blasting Powder.
☐ Buckets.
☐ Cars.
☐ Centrifugal Pumps.
☐ Compressors.
☐ Conveying Equipment.
☐ Conveyors.
☐ Cranes.
☐ Crushing Plants
☐ Crushers and Derricks.
☐ Dragline Excavators.
☐ Dredging Pumps.
☐ Drills.
☐ Dump Cars.
☐ Dynamite.
☐ Elevators and Conveyors.
☐ Elevating Equipment.
☐ Engines, Gasoline.
☐ Gasoline Locomotives.
☐ Hydraulic Dredges.
☐ Hoisting Engines.
☐ Hoists.
☐ Industrial Railways.
☐ Loaders.
☐ Locomotive Cranes.
☐ Locomotives.
☐ Motors.
☐ Motor Trucks.
☐ Power Transmitting Equipment.
☐ Pumps.
☐ Rock Drills.
☐ Sand Pumps.
☐ Screening Equipment.
☐ Screening Plants.
☐ Screens.
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☐ Steam Shovels.
☐ Tracks.
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☐ Washing Equipment.
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☐ Check here if you need services of engineer.

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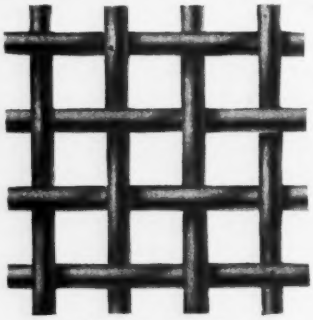
City _____ **State** _____



2½ Mesh; 105 Wire

CLEVELAND
DOUBLE-CRIMPED
WIRE CLOTH

Renowned for its Uniformity, its Superior weave, its Durability.
Especially adapted for SAND and GRAVEL Screens.
A large stock of the various meshes always on hand.

Prices right—Catalog on request

THE CLEVELAND WIRE CLOTH & MFG. CO.
3573-81 E. 78th STREET, CLEVELAND, OHIO

Large or Small

Portable Crushing Plant, 100 tons per hr. capacity

propositions are handled by us with equal facility and efficiency, by reason of our experience, methods and superior organization. We have designed and supervised some of the largest propositions in this country and also some of the smallest. In every case we have absolutely satisfied our clients. Our plants pay dividends.

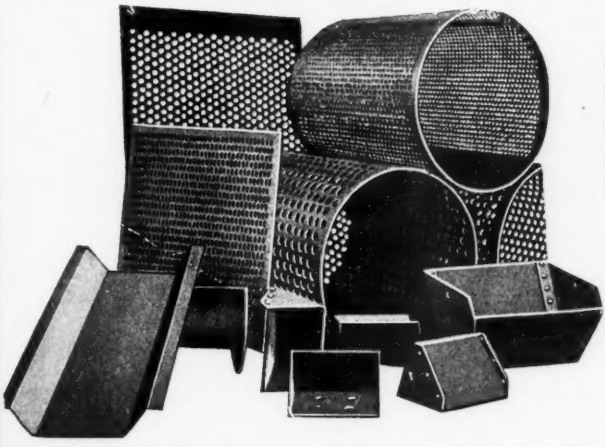
WE ARE PRIMARILY ENGINEERS AND SPECIALISTS IN SELECTING EQUIPMENT

We Specialize in heavy duty Automatic operation.

INVESTIGATE OUR LIME HYDRATOR AND POIDOMETERS.

THE SCHAFFER ENGINEERING AND EQUIPMENT CO., Tiffin, Ohio, U.S.A.

Perforated Metal Screens
FOR STONE, SAND, GRAVEL, ETC.



Plates flat; rolled to diameter or radius for revolving and conical screens butted or lap joints

Elevator Buckets
in all styles and sizes

HENDRICK MFG CO., 39 Dundaff Street CARBONDALE, PA.

WHATEVER YOU NEED IN PERFORATED METALS

There is no branch of the sand, gravel and crushed stone industry for which we cannot furnish the highest quality of perforated metals and screens at rock bottom cost and immediate deliveries.

NORTMANN-DUFFKE FDRY. CO., Milwaukee, Wis.

PROMPT

DELIVERY

Thomas Hoists

Electric, Steam and Gasoline

Incline Railway Hoists
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Two Speed Hoists for
Slack Line Cableway Service
Clam Shell Derrick Hoists

In Thomas Hoists are embodied the results of 20 years' experience devoted to exclusive manufacture of Hoists. We make a hoist for every class of service and have built our reputation on **Quality.** Write for catalog.

Manufactured by **Thomas Elevator Co.** 33 S. Hoyne Ave. CHICAGO, ILL.

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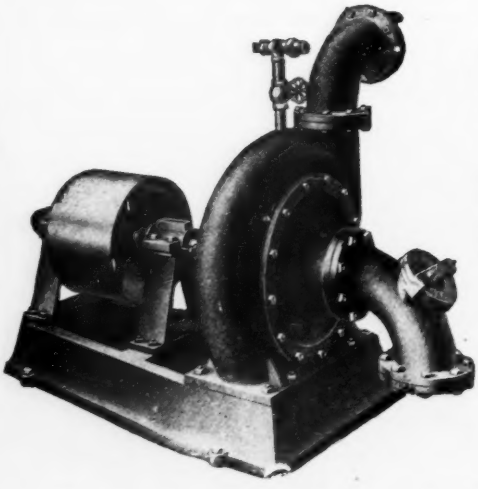


For handling sand, gravel, and other solids in suspension at a minimum cost, use

Erie Sand-Gravel Dredging Pumps

Small sizes as well as largest ones are designed to give maximum output and greatest wear for a given weight.

Tell us your conditions and ask for Bulletin P-30

ERIE PUMP & EQUIPMENT CO., Erie, Pa.

ECONOMICAL EXCAVATING

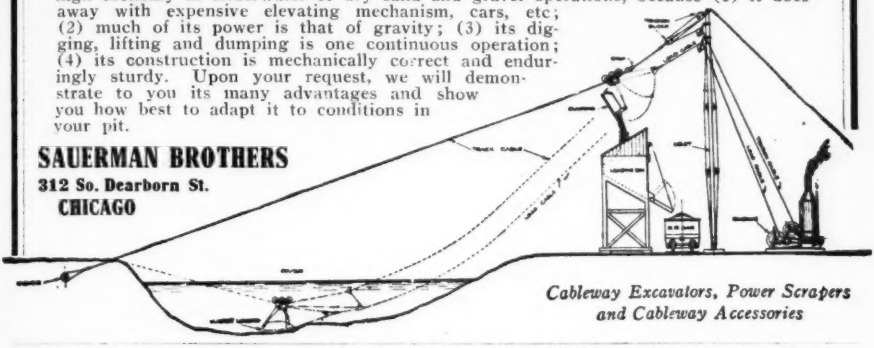
of Sand and Gravel

is best accomplished with

SHEARER & MAYER DRAGLINE CABLEWAYS

Not least among the advantages of this outfit, is its adaptability to almost any conditions. Six years of successful operation have established it as a machine of high economy in underwater or dry sand and gravel operations, because (1) it does away with expensive elevating mechanism, cars, etc; (2) much of its power is that of gravity; (3) its digging, lifting and dumping is one continuous operation; (4) its construction is mechanically correct and enduringly sturdy. Upon your request, we will demonstrate to you its many advantages and show you how best to adapt it to conditions in your pit.

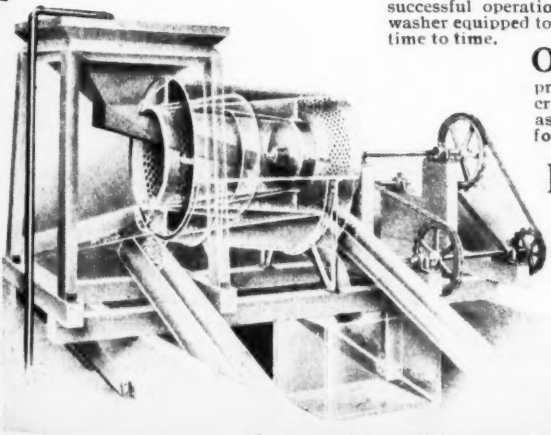
SAUERMAN BROTHERS
312 So. Dearborn St.
CHICAGO



Cableway Excavators, Power Scrapers and Cableway Accessories

SMALLER

—initial outlay
—operating cost
—space required
—expense for auxiliary machinery



NEW and BETTER

The Biesanz Sand and Gravel Washer is marketed "by request"—in answer to a call to benefit the trade with a money-saving, space-saving, equipment-saving, better product machine — though it was first made for their private use. The

BIESANZ Sand and Gravel Washer

is "different" in these respects; "Nested" screens economize space; the larger-perforated screens having the small surface; the output is uniform; does away with the necessity of high bins, large space, long shaftings, numerous sprokets and high-powered drive. Now in successful operation in large and small plants. Our washer equipped to start with. It can be added to from time to time.

OPPORTUNITY

presents itself in this machine for concrete products manufacturers as well as the sand and gravel man. Write for particulars.

Biesanz Stone Co.
WINONA, MINN.

Suitable for plants of any capacity. Erection plans made to fit local conditions.

We're Ready

to meet your requirements in full for high grade

Track Equipment

A complete line of frogs, switches, crossings, crossovers, switch stands, etc.

Ask for Catalog 103

The CINCINNATI FROG & SWITCH COMPANY
MANUFACTURERS OF
TRACK EQUIPMENT FOR
STEAM AND ELECTRIC RAILROADS
MINES AND MILLS
CINCINNATI, O.

CLOSING OUT CRUSHERS

We still have a few crushers on hand which we wish to sell before Spring. Machines are ready for shipment, complete, and first class. Prices are attractive.

1 **Gates** No. 3, rear drive, short head, "D."
1 **Gates** No. 4, rear drive, "D."
2 **Gates** No. 5, rear drive, chilled iron, style "D," fine condition.
2 **Austin** No. 5, rear drive.
1 **Gates** No. 5, style "K," rear drive.
1 **Gates** No. 6, style "D," chilled iron, rear drive.
1 **Symons Disc**, 24".
Kennedy No. 27, three years old.

WE ALSO HAVE

4 **Boilers**, 72"x20', 150 h. p., horizontal tubular, good for 130 lbs. pressure, new grates and full flush fronts.
1 **Gould Centrifugal Pump**, 8", sand and gravel, belted.
1 **Locomotive Crane**, American, 15-20-ton, 4-wheel, 40' boom, equipped for bucket, 54" boiler, 8¼x10 engines.
1 **Gould Centrifugal Pump**, 10", sand and gravel, belted.
1 **Erie Centrifugal Pump**, 6", sand and gravel, belted.

MOORE BROS.

New York Life Building **CHICAGO, ILLINOIS**

Immediate Delivery

"He who serves best profits most"

Big Snap in Koppel Road Builders' Outfit

32685 Ft. Koppel 20-lb. Clip and Bolt Track, 7 ties per 15 ft. sections.

10565 Ft. Koppel 20-lb. Clutch Bolt Track, 7 ties per 15 ft. sections.

525 Ft. of Curved Track in 15 ft. sections, 7 ties per section.

141 Special Curves each 16'—15/16" length, 7 ties per section

60 Koppel cars all steel cradle cars 1½ yd. without brake.

1 Track Laying Car.

8 Portable Switches, 4 R. H. and 4 L. H. 20x15' 0"x24" Ga.

1 Model 28 Marion Steam Shovel, shop No. 3323.

1 13 Ton Geared Shay Dinky 6x10, shop No. 2826.

1 13 Ton Geared Shay Dinky 6x10, shop No. 2812.

1 Good Roads Stone Unloader.

This Equipment is Ready for Immediate Shipment and in First Class Condition

Phone, wire or write

For sale by the

Marsh-Bothe Machinery Co.

975 Old Colony Building
Chicago, Illinois

MARSH'S GUARANTEED LIST

CRUSHERS

1 No. 2 Gates D.
1 No. 3 McCully.
1 No. 4 Austin.
1 No. 5 Gates K.
1 No. 6 Gates D.
2 No. 7½ Gates D. & K.
1 No. 8 Gates K.
1 No. 9 Gates D.
1 No. 12 Gates complete plant.
1 48x60 Gates jaw.
Can furnish elevators and screens with all of these.

SCREENS

1 48" x 17' Gates screen, complete.
1 60" x 20' Gates screen, complete.
1 48" x 24' Screen, complete.

ROLLS

2 36" x 22" Buchanan Rolls.
1 36" x 16" Superior sand rolls.

CEMENT MAKING MACHINERY

2 5' x 22' Allis-Chalmers tube-mills.
9 6' x 60' Cement kilns, complete.
10 Kent mills.

LOCOMOTIVE CRANES

1 20-ton Brownhoist 8-wheel 50' boom.
1 25-ton Industrial (Bay City) crane, 8-wheel M. C. B. 50' boom.
1 20-ton Ohio 8-wheel M. C. B. crane, 50' boom, 1½-yard bucket.
1 No. 1 Browning 4-wheeled, bargain.

COMPRESSORS

3 Laidlaw-Dunn-Gordno 30x20x20 belt-driven compressors, capacity 2,870 ft. per min., complete with motors.
3 Ingersoll-Rand "Imperial 10," class X-B-2 belt-driven compressors, capacity 2,400' per min., 28x17x24.
1 Knowles-Blake 16x10x10 belt-driven compressor, 430' per minute.
1 Ingersoll-Rand class N-E-1 belt-driven compressor, 300' per min., and a lot of steam driven.

STEAM SHOVELS

1 Model "250" Marion revolving stripping shovel, with drag-line equipment.
1 Model "100" Marion 5-yard shovel, 136-ton, railroad trucks.
1 Model "91" Marion, 103-ton, 5-yard shovel, railroad trucks.
3 Model "75" Marion shovels, 3-yard dipper, 96-ton.
3 Model "70-C" Bucyrus shovels, 2½-yard dippers, 80-ton.
1 Model "28" Marion traction revolving shovel, 18 tons, ⅝-yard.
3 Type "O" Thew traction revolving shovels, 18 tons, ⅝-yard.

LOCOMOTIVES (STANDARD GAUGE)

3 Baldwin Consolidation, 20x24, weight 70 tons each.
1 19x26 Baldwin 10-wheel locomotive, 180-pound pressure.
1 65-ton Shay geared locomotive, standard gauge.
1 15x22 Baldwin 4-wheel saddle-tank, weight 25 tons.

LOCOMOTIVES (NARROW GAUGE)

8 10x16 Vulcan 36"-gauge 18 ton locomotives, steam-brake.
4 11x16 Porter 36"-gauge 18-ton saddle-tank locomotives.
2 7x12 24"-gauge 9-ton saddle-tank locomotives.

CARS (STANDARD GAUGE)

50 hopper-bottom 60,000-pound capacity coal cars.
100 Western 12-yard two-way air-dump cars.
25 Oliver 12-yard two-way air-dump cars.
13 Oliver 6-yard two-way air-dump cars.

CARS (NARROW GAUGE)

100 4-yard Western two-way dump cars, 36"-gauge.
25 3-yard Western two-way dump cars, 36"-gauge.
20 36"-gauge 2½-yard end-dump quarry cars.
10 24"-gauge 2-yard end-dump quarry cars.

HOISTING ENGINES

1 10x12 3-drum Lidgerwood cableway engine, 50 H. P.
2 8½x10 Lidgerwood D. C. D. D. hoisting engines.
2 7x10 American D. C. D. D. engines with boilers.

CLAM AND ORANGE-PEEL BUCKETS

2 2-yard Hayward class "E" clam-shell buckets.
1 1½-yard Hayward class "E" clam-shell buckets.
1 1-yard Browning clam-shell bucket.
1 2-yard Page dragline bucket.
1 1-yard Page dragline bucket.

CABLEWAYS

1 Lidgerwood cableway, complete, 750' span, 10x12, 3-drum main engine, carriers, carriage, etc.
1 Shearer & Mayer 1¼-yard 600' span Lidgerwood slack-line cableway and some others.

STEAM ENGINES (CORLISS)

1 16x42 Lane & Bodley Corliss 200 H. P., wheel 12' x 23".
1 20x42 Hamilton Corliss 300 H. P., wheel 14' x 26".
1 24x48 Hamilton Corliss 500 H. P., wheel 16' x 35".

BOILERS (WATER-TUBE)

6 200 H. P. Babcock & Wilcox McClave shaking grates, 150 pounds.
1 250 H. P. Stirling one-battery shaking grates, 150 pounds.

DERRICKS

1 American steel derrick, 115' mast, 112' boom, with bull-wheel.
1 Stiff-leg derrick, 82' boom, 45' mast, 12' bull-wheel.
1 Guy derrick, 70' boom, 60' mast, steel bull-wheel.

MOTORS

1 450 H. P. Westinghouse CCL 25-cycle, 3-phase, 440-volt motor.
2 75 H. P. General Electric Motors, 60-cycle, 3-phase, 220-volt.
1 40 H. P. Westinghouse 60-cycle, 3-phase, 220-volt.

GEORGE C. MARSH & CO.

777 OLD COLONY BUILDING, CHICAGO

1000 Feet

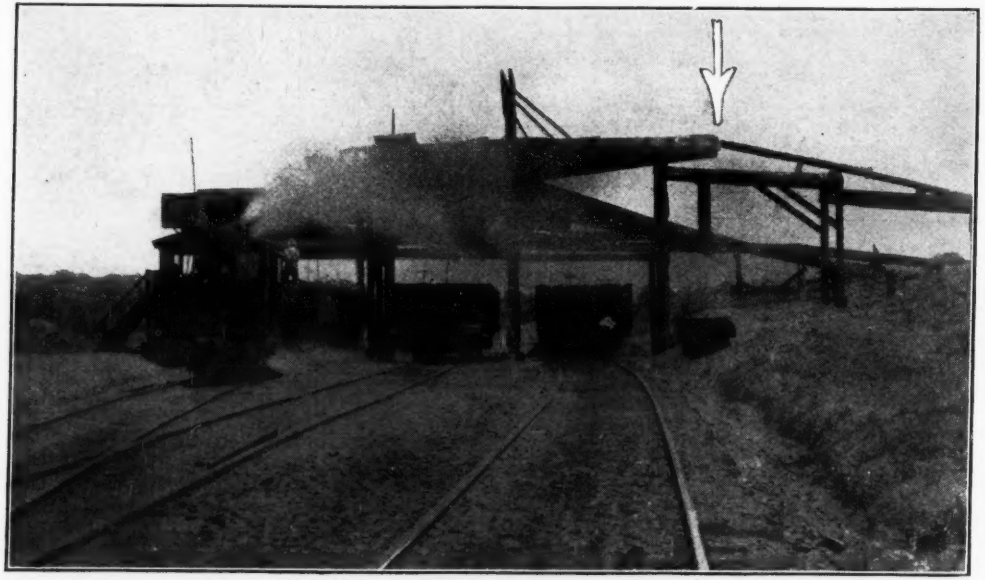
from this screening plant is a—

MORRIS
10-in. Pump

which averages 1000 Tons per day.

One day on a 600-ft. pipe line it produced in ten hours 2040 Tons.

Have You Our Catalog?



Plant of Lincoln Sand & Gravel Company, Lincoln, Ill.
Discharge pipe is 33 feet above surface of water.

MORRIS MACHINE WORKS
BALDWINSVILLE, N. Y.
Branch Offices in Principal Cities

THE BELL LOCOMOTIVE

OIL BURNING — LOWEST POSSIBLE CENTER OF GRAVITY 50% GREATER TRACTIVE EFFORT. NO SMOKE or SPARKS

For pit or quarry, Bell Locomotives have the advantage of being small but powerful, simple, sturdy and inexpensive both initially and in daily operation.

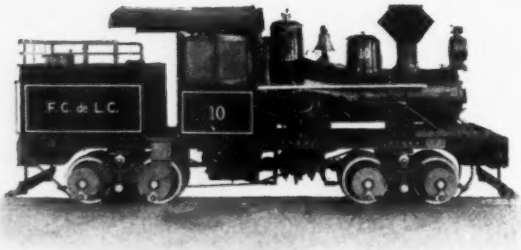
LOW PRICED, ONE MAN OPERATED. ALL PARTS INTERCHANGEABLE. ONLY 15 OR 20 MINUTES TO FIRE UP FROM COLD. MORE SPEED.

GUARANTEED

WRITE FOR FOLDER

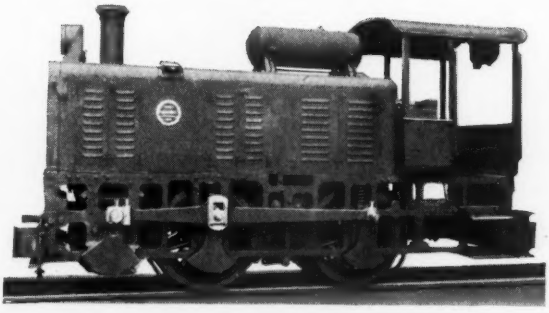
BELL LOCOMOTIVE WORKS, Inc., 30 Church St., New York, N. Y.

Heisler Geared Locomotives



Do you realize what the Heisler Geared Locomotive can do with its all steel, flexible swivel trucks and center shaft drive; short rigid wheel base, load equally distributed on all wheels; all wheel drivers, each driver having eight impulses of engine to each revolution? This means efficient service on uneven tracks, sharp curves, steep grades; saves in track construction and maintenance. Has a record of always being on the track and ready to start a load quickly. Has many decided advantages over the direct connected or gasoline locomotives for pit and quarry operations. It will pay you to investigate this locomotive for your service. Built in all sizes and gauges. Write today for all particulars.

HEISLER LOCOMOTIVE WORKS :: ERIE, PA.



Baldwin Gasoline Locomotives

are suitable for work in quarries, industrial plants and construction service. They are strongly built and simple to operate; are ready for work at any time, but consume no fuel while standing idle. There are four standard sizes, weighing respectively 3½, 5, 7 and 9 tons. The style of cab, and the equipment used, can be arranged to suit operating conditions.

Baldwin Record No. 74 tells all about these machines.

The Baldwin Locomotive Works

Philadelphia, Pa., U. S. A.

REPRESENTED BY

F. W. WESTON, 120 Broadway, New York, N. Y.

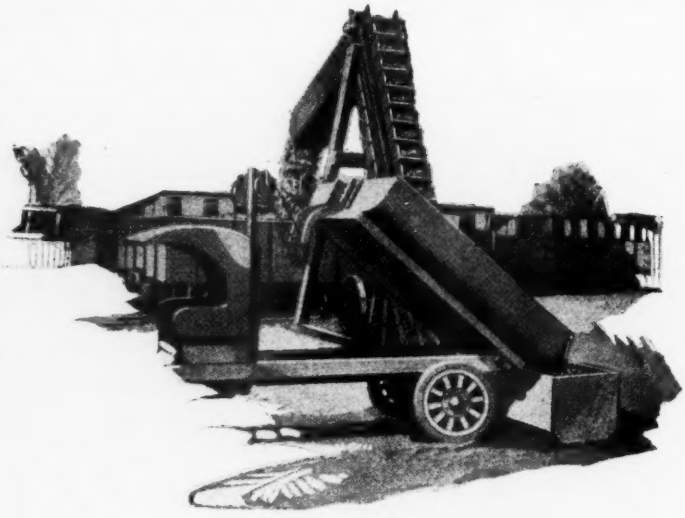
CHARLES RIDDELL, 627 Railway Exchange, Chicago, Ill.

C. H. PETERSON, 1210 Boatmen's Bank Bldg., St. Louis, Mo.

GEORGE F. JONES, 407 Travelers Building, Richmond, Va.

A. WM. HINGER, 722 Spalding Building, Portland, Ore.

WILLIAMS, DIMOND & CO., 310 Sansome Street, San Francisco, Cal.



It costs you just 25c to load that 50-ton car with a SUNBURY

Just one gallon of gasoline—no more. Started the engine in the morning, dumped a truckload in the bin—went after another—and when he got back the first load was in the car. This was repeated until the car was loaded—in ONE HOUR. Pretty quick work! That's what makes your trucks valuable. You'll have to *hustle them* to keep up with a Sunbury.

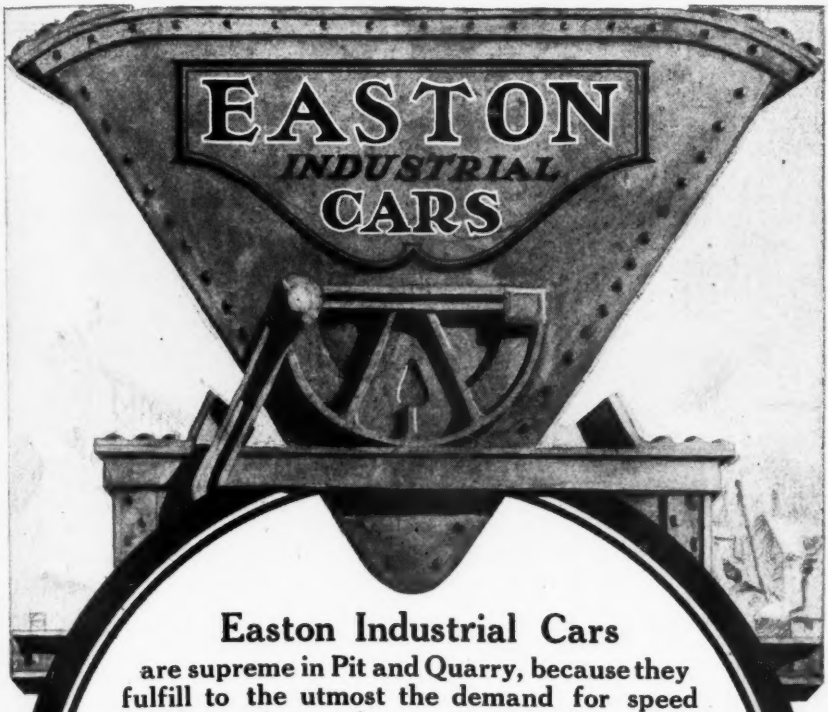
It loads and it unloads.

You can buy one that you can use for both and it won't cost you one cent more. Write for detailed description.

THE SUNBURY MANUFACTURING CO.

HOME OFFICE and FACTORY:

SUNBURY, OHIO



Easton Industrial Cars

are supreme in Pit and Quarry, because they fulfill to the utmost the demand for speed and convenience of operation, and long life of service. They may be had in Double Side Dumping or Double End Dumping form; devices for automatic return to upright position or remaining dumped may be adjusted to suit the nature of the materials and work, and rigid locking mechanism prohibit dumping at the wrong time or to the wrong side. They are all steel. Bearings are dust proof.

The reputation for service established by Easton Double Dump Cars extends as well to our Industrial Cars of all kinds, Track, Rails, Wheels and Accessories.

Ask for pamphlet 100-P covering equipment for operators of pits and quarries.

RAILS
PORTABLE
TRACK AND
ACCESS-
ORIES

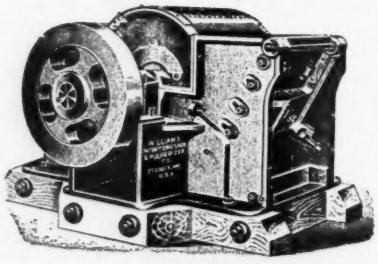
EASTON CAR & CONSTRUCTION CO.

Designers and Builders of Industrial Cars and Track

NORTHAMPTON ST.
EASTON · PA ·

OFFICES: NEW YORK, BOSTON, CHICAGO, DETROIT, PITTSBURGH

FROM 14" TO 18" CUBES TO 1½"- 1"- ¾"- ½" IN ONE OPERATION



BY using Williams Jumbo Crushers to take the feed from the very large Gyratory Crushers, the smaller or intermediate crushers, which were formerly necessary, can be eliminated as the Williams Jumbo Crusher will reduce these large cubes ranging in size from 14" to 18" to a product either 1½"-1"-¾" or ½". Capacities from 60 tons per hour to 200 and 300 tons per hour. Complete description of this extraordinary crusher is given in

BULLETIN NO. 85

THE WILLIAMS PAT. CRUSHER & PULVERIZER CO.

Gen'l Sales Dept., Old Colony Bldg.,
CHICAGO

When Buying Steam Shovel Chain

there are three factors to consider:

QUALITY - STRENGTH - ENDURANCE

TAYLOR
MESABA

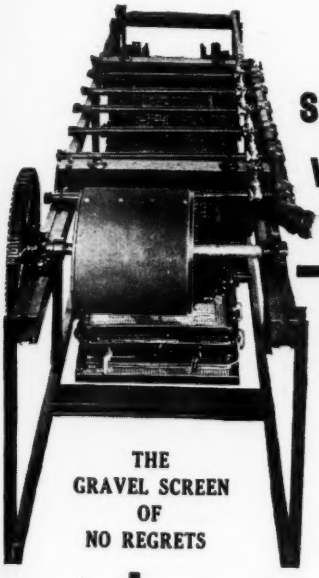
Steam Shovel Chain has these factors

Look for these names on the Padlock Link

Sizes carried in stock—⅞", 1", 1⅛", 1¼", 1⅜", 1½", 1⅝"

S. G. TAYLOR CHAIN COMPANY

138 South Dearborn St. CHICAGO, ILLINOIS



THE
GRAVEL SCREEN
OF
NO REGRETS

SCREENING AND WASHING FOR LESS THAN 1C PER YARD

1c a yard is the figure at which an actual commercial plant turned out 60 yards per hour of perfectly graded and clean sand and gravel of five different sizes. In the plant shown below, the E & S Shaker Screen with washer attachment replaced a $30,000 outfit of a different make, part of which still standing is shown on the left of the photo.

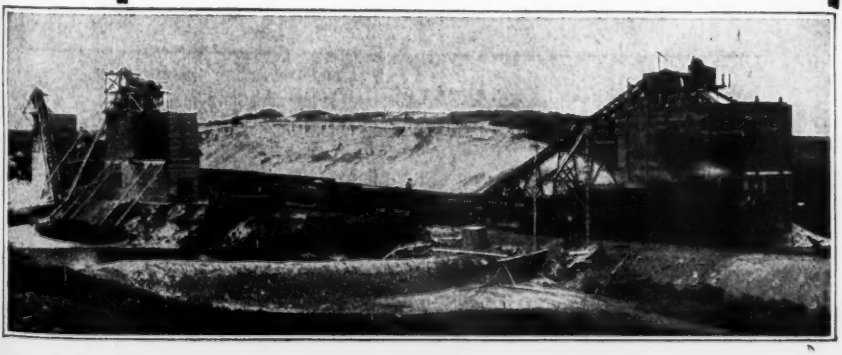
E&S SHAKER SCREEN WITH WASHER ATTACHMENT

is simply the latest of the great efficiency and economy inventions that are bound to develop from time to time in every industry. It has been in practical use for 6 years. It has proved its distinctive merit beyond question. Exactly eccentric motion gives the screens a decided "throw," thus turning out more material at less cost than any other outfit of the same capacity.

There are a score of reasons, every one vital, to you, why you should give the E & S screening outfit your immediate and careful investigation. Start it out by dropping us a line of inquiry today.

WE
DESIGN
COMPLETE
PLANS

The EXCAVATING & SCREENING MACH. CO.
748 SECURITY BLDG., MINNEAPOLIS, MINN.



This Jeffrey Self-Propelling Wagon and Truck Loader

Reduced Operating Cost 25 to 50%

BELL PHONE 1615. STARK PHONE M-6143.

H. W. DAUCHEY.

SAND, GRAVEL, CEMENT AND THEIR PRODUCTS.

OFFICE AND FACTORY

NORTH INDUSTRY AND BOLIVAR ROADS

CANTON, OHIO, 3/28/16 191.

The Jeffrey Mfg. Co.
Columbus, Ohio.

Gentlemen:-

Referring to the A-15 Jeffrey Loader purchased from your Mr. Heller in October, 1915, I am pleased to say that it saved from 25 to 50% in my cost of operation.

Four men repeatedly screened and loaded into dump wagons over 100 yards of material in a day of 10 hours and on one day they got as much as 175 yards

We used the machine directly on the breast of the pit. The machine elevating and screening gravel into one wagon and sand into another wagon, in a satisfactory manner.

Very truly yours,

H. W. Dauchey.

Bulletin No. 177-90 has complete Specifications and Details of our Standard Self-Propelling Loaders. Send for copy of this interesting book.

The Jeffrey Manufacturing Co.

990 North Fourth Street, Columbus, Ohio